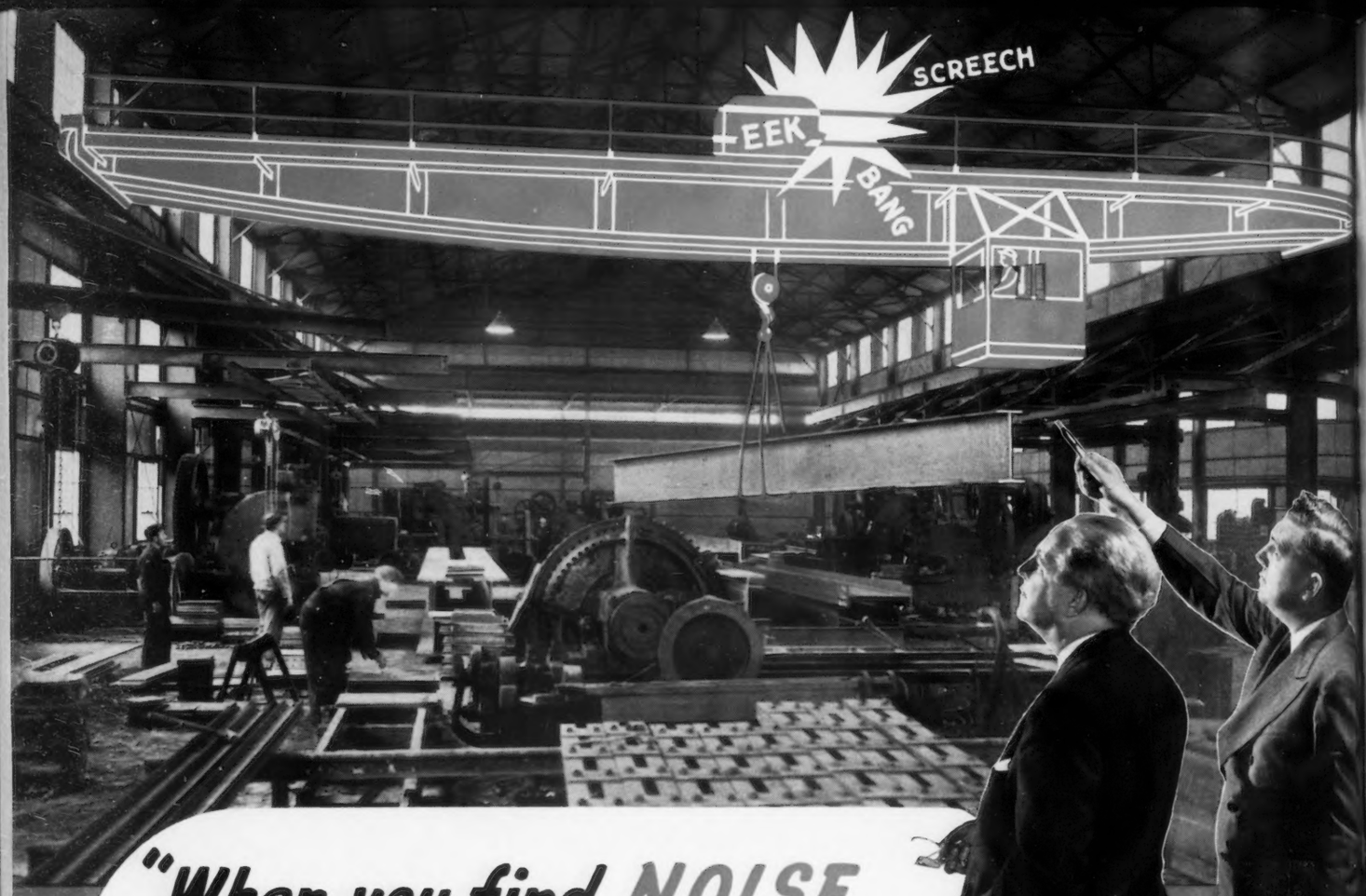
APRIL 17, 1941

The IRON AGE



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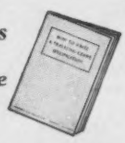

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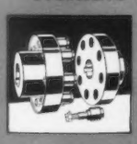

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WHITING

OVERHEAD TRAVELING CRANES

This Week in The Iron Age

APRIL 17, 1941

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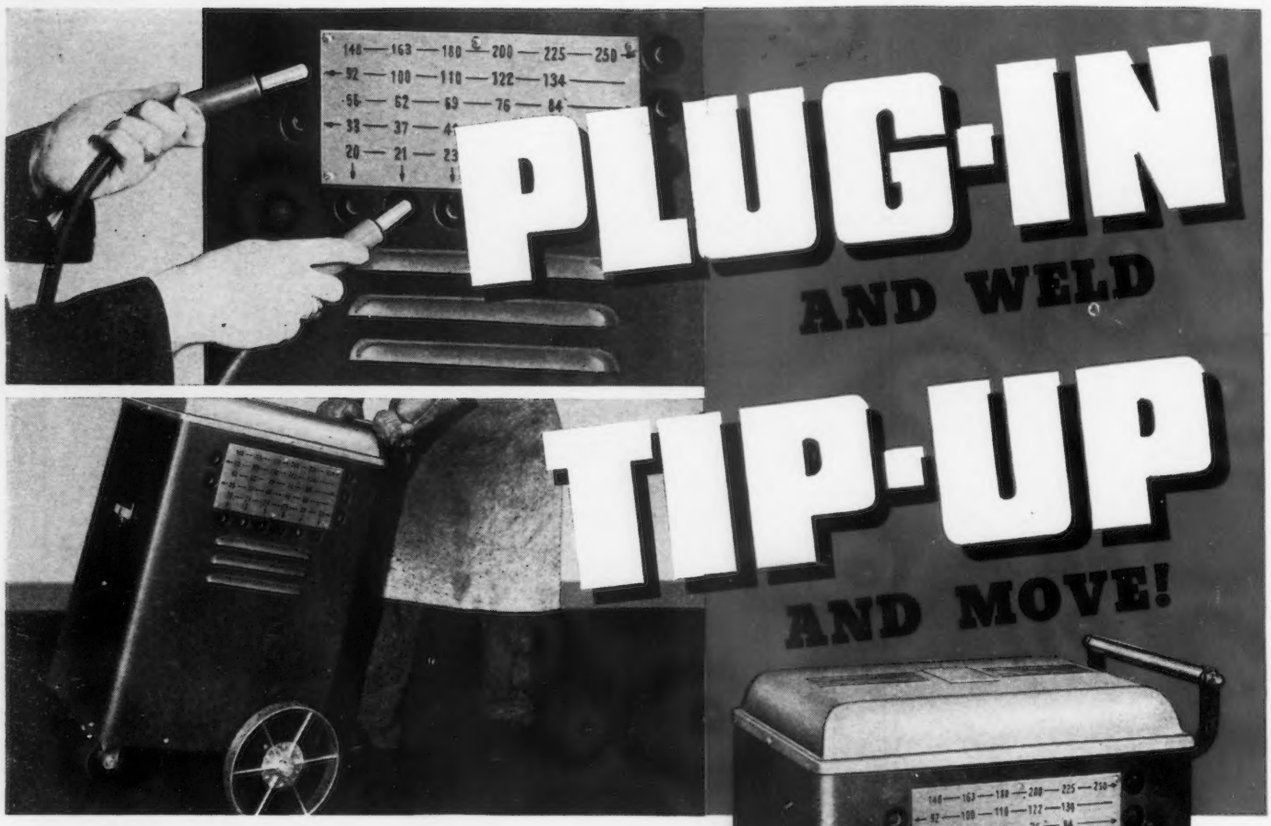

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The Iron Age

APRIL 17, 1941

ESTABLISHED 1855

Calling All Dreamers

THIS editorial will deal with dreams. Not the kind that come to men while asleep, but the day dreams of which the poet John Masefield said:

> The dream that fires man's heart to make,
> To build, to do, to sing or say
> A beauty death can never take,
> An Adam from the crumbling clay.

To fire men's hearts "to make, to build, to do," our day dreams must set the stage for the introduction of ideas. And the ideas must result in action. Unless the idea and the action follow the dream, it is merely an air castle. "All men of action are dreamers" but all dreamers are not men of action.

American business and industry have been plentifully supplied with constructive dreamers. That is why America today is in the position to feed and to finance the rest of the world.

Fulton dreamed of a steamboat and made his dream come true. Edison dreamed many dreams, creating the phonograph, the incandescent lamp, the motion picture and a hundred and one familiar and indispensable realities. Andrew Carnegie dreamed of an empire in steel—and built it. Henry Ford dreamed of a low priced car that could be bought by thousands of people, and made them in millions. Inventors and industrialists throughout our land have dreamed dreams and lived to see the vision of these dreams turn into tens of thousands of new products and into thousands of busy factories employing millions of workers.

It is time for these practical dreamers of ours, our men of action, to dream some new dreams. New and larger ones. If they do not, the impractical dreamers will get the jump on them, to their detriment and the detriment of the future of America.

Hitherto, our practical dreamers of industry and business have kept their dreams to the confines of a product, a business or at most, an industry. Now they must enlarge their dream horizons to cover the future relations in industry and business to America and of America to the problems of post-war reconstruction.

The test of our American System of Enterprise was not the depression; it is not the armament program, it will not even be war if we come to that. The test of our system and its survival will be in the time to come when the post-war consuming power of our people lags far, far behind the mushroomed production capacity of our factories.

Unless, when that time comes, our practical men of vision in industry and business can step forward with a plan, they will find themselves and their country vulnerable to the efforts of men and women to whom our traditional system is anathema and who are already making the blueprints for a new and strange America.

J. H. Van Deventer

Inland freighters have coaled and headed north to the ore docks.

Inland Freighters Start the 1941 Season

The Inland fleet of Great Lakes freighters is pushing its way through ice in the Straits of Mackinac, and in Whitefish Bay on Lake Superior. This is the start of the 1941 shipping season, when enormous quantities of selected raw materials, from Inland's own sources of supply, will be brought to the Inland mills on the southern shore of Lake Michigan.

After a winter of careful and thorough preparation, the Inland fleet is ready for the strenuous season ahead.

Before ice again blocks the passages in the Upper Great Lakes, Inland freighters will have brought record tonnages of raw materials to the Inland docks. Huge stores of ore, coal and limestone will be needed for the year ahead, when all production records will be broken.

With assured adequate supplies of raw materials, brought from its own mines and quarries in its own freighters, Inland will be prepared to do its full part in meeting the national emergency.

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Powder Metallurgy

—Some Important Theoretical Aspects

o o o

By CLAIRE C. BALKE

Powder Metallurgist, Fansteel Metallurgical Corp., North Chicago, Ill.

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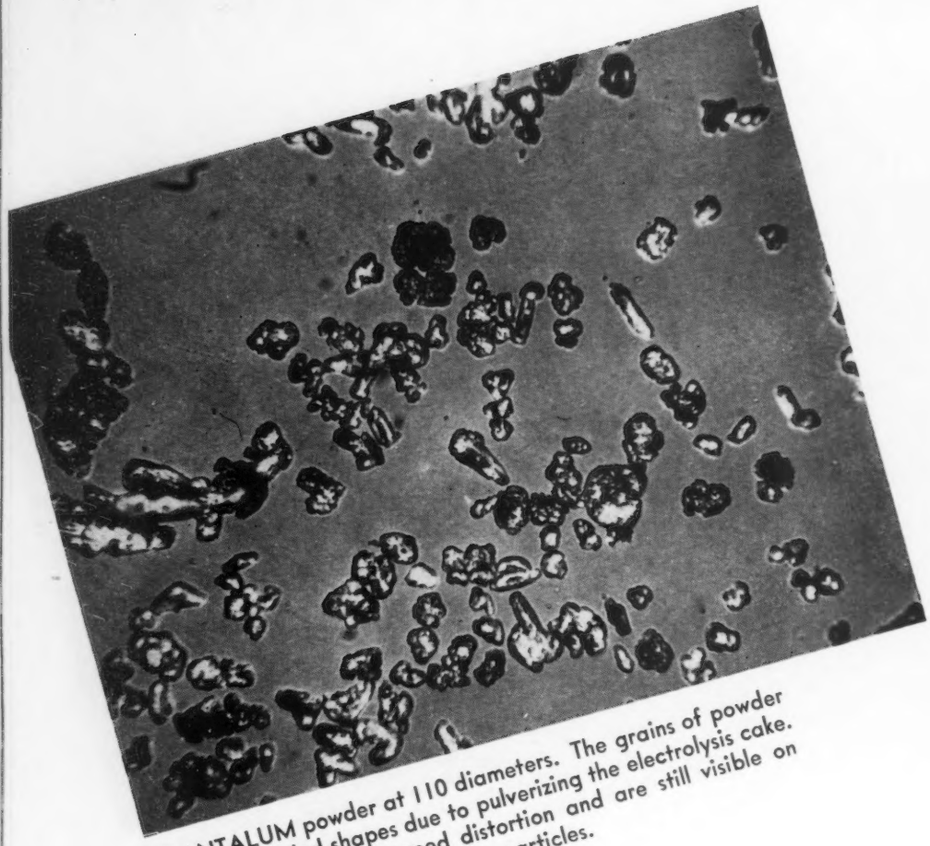
POWDER metallurgy can best be defined as the art of producing objects from metal powders with or without the inclusion of non-metallic constituents, and with or without fusion of one or more minor components of the composition. In the practice of this art the powder is usually pressed into a desired form which is subsequently or simultaneously heated to produce a coalesced, alloyed or welded mass. The advantages of the powder-metallurgy technique have been extensively described in many technical and non-technical reports in the past few years. For this reason it would be worth while to review briefly some of the theoretical aspects which must be thoroughly understood before success may be attained with this technique.

Powder metallurgy had its first real scientific enunciation in the work of Wollaston. In 1828 he prepared pure, solid, ductile platinum from its powder. Nevertheless, according to a recent theory concerning the method of formation of gold nuggets, nature was using some of the methods used in powder metallurgy, and therefore rates as the first powder metallurgist. The flecks of gold occurring in the gold-bearing dikes were washed downstream, and because of their high gravity collected in pockets at the bed of the stream, where they were tumbled, rolled and hammered together to form a solid nugget. In this way nature slowly put one particle of metal together with another. The scouring effect of the sands of the stream bed kept the surfaces clean, and it is fortunate that gold is of itself a very noble metal, otherwise oxidation of the surface of the particles would have prevented cohesion. This metal also had the further advantage of ductility, which allowed the particles to be readily deformed under pressure into a more dense piece.

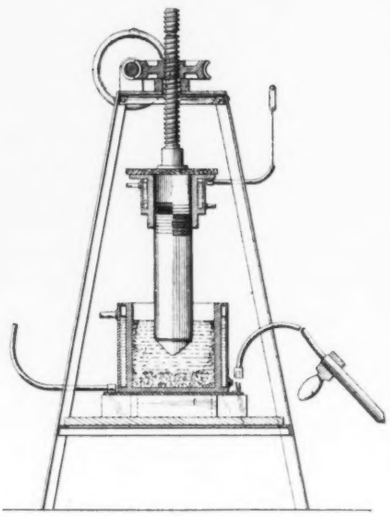
There are four main stages or steps in the powder metallurgy process: first, the preparation of the powder; second, the compaction of the powder into a piece having some desired shape; third, the heating of the compact to obtain a desired solidity and structure; and fourth, the properties of the final piece. Some of the most interesting theoretical aspects of the powder metallurgy technique concern themselves with the first and third steps, namely the particle of metal itself and what goes on when a compact of the particles is heated. In putting particles of metal together to obtain a solid piece, there are a number of difficulties which must be overcome. These might be called "obstructions"; and the first obstruction is the most obvious—the actual shape of the particle of metal.

For simplicity, suppose that the particles of metal are mathematically perfect cubes or parallelepipeds, and that they could be put together, one at a time, in a pile much as bricks are laid. Once this operation had gone far enough, a solid piece of metal would be obtained, yet no pressure and no heat were employed. Advantage was taken only of the atomic bonds which are residual at the surface



TANTALUM powder at 110 diameters. The grains of powder have rounded shapes due to pulverizing the electrolysis cake. Some crystal faces escaped distortion and are still visible on some of the particles.

DIAGRAMMATIC sketch of apparatus for the electrolysis of K_2TaF_7 to produce metallic tantalum powder. Shows water cooled iron pot cathode, graphite anode and small auxiliary electrode for starting the electrolysis.



of the metal. Perhaps the "pile of bricks" might have to be jarred slightly to cause sufficient orientation of the bonds between particles, but even recrystallization would not have to be considered if it is assumed that the atomic lattices of each cube were arranged all in the same direction. In other words, a single crystal of solid metal would be built up. However, no such conditions exist. Modern industry has neither the equipment nor the time nor the patience to fit little cubes together. The metal particles do not have such a shape—they have all shapes and all sizes. For this reason the study of particle size distribution takes on a decided importance.

Ductility Is Desirable

The obstruction of shape can be overcome to some extent by making the particles ductile, so that when pressed in a die they will deform readily to occupy the empty spaces which would exist in a loose pile of the powder. Often a metal powder, in its preparation by mechanical means, is so work-hardened that it does not deform readily, and therefore must be annealed before pressing. Thus, the actual shape of the particles of metal have a decided obstructing influence in the attainment of a solid piece.

A second and very serious obstruction is the condition that exists at the surface of the particle, namely, surface films usually of an oxide character which have formed through some chemical reaction of the metal with the atmosphere. It is known that the first visible heat-tint color, a pale yellow straw, is formed on iron at a relatively low temperature of only a few hundred degrees C., and that this is caused by a layer of iron oxide having a thickness of approximately 42 Ängstroms. Such a depth is roughly ten times the height of the unit prism of ferric oxide.

It is also appreciated that the atomic cohesive force between atoms is barely effective, practically speaking, at a distance of several atoms. Therefore, when two particles of iron are brought together each having on its surface a nonmetallic film 42 Ängstroms deep, practically no cohesive force could be obtained at all between the metal of the two particles unless the blanket of oxides were pieced by using pressure. Indeed a film having a thickness of only a few Ängstroms might very effectively prevent metallic cohesion. The oxide film on the surface of metals makes itself apparent when comparisons are made between the noble metals and the baser ones. For instance, gold or platinum powders are very readily pressed together to make a solid piece. In these cases the oxide film "obstruction" is almost nonexistent, whereas other powders equally ductile must be kept in air-tight containers, and even in the short time involved in transferring them to a pressing die, acquire a thin film of oxide on the surface of the particles. One of the worst actors in this respect is lead powder.

Impurities on the surface of the metallic particle may be other than chemical compounds. No surface is really dry. Moisture or even the common atmospheric gases are con-

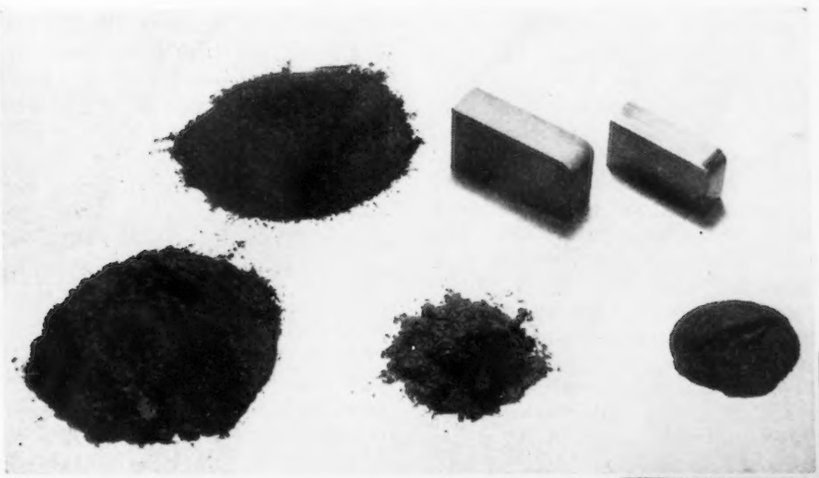
densed on the surface of the metal or held in the film of oxide. When a metal powder containing this type of impurity on its surface is pressed into a tightly knit compact, small pockets or voids will be left in the piece when it is heated, and will sometimes cause it to expand. Since the amount of these adsorbed gaseous impurities, as well as the oxide film, is a function of surface, the powder metallurgist is faced with a new problem, which is of little concern to his contemporary working with the massive metals. For instance, a cube 1 cm. on an edge is bounded by 6 sq. cm. of surface; if this cube is divided into smaller ones each having an edge of only 1 micron, the total surface will reach the enormous value of 60,000 sq. cm., or 64.5 sq. ft. A metal of such fine subdivision might not be 100 per cent metal; it might contain 5 per cent oxide. Fine iron, lead and copper powders must be stored very carefully to prevent the adsorption of impurities and subsequent oxidation. Copper powder will often oxidize in a few minutes if allowed to stand in the open.

This little particle of metal might also contain dissolved gases or dissolved impurities of some other nature. Most metal powders are prepared in a gaseous atmosphere, for instance the reduction of metal oxides in hydrogen or carbon monoxide or producer gas, and they can readily dissolve some of the gas, even when in the solid condition. This undoubtedly makes the particle harder and less apt to deform under pressure—less apt to make more extensive contacts with its neighboring particles in the pressed compact. For instance, tantalum powder will dissolve as much as 700 volumes of hydrogen under extreme conditions, and under normal production operations may contain as much as 150 volumes of hydrogen which must be removed in order to make the metal ductile.

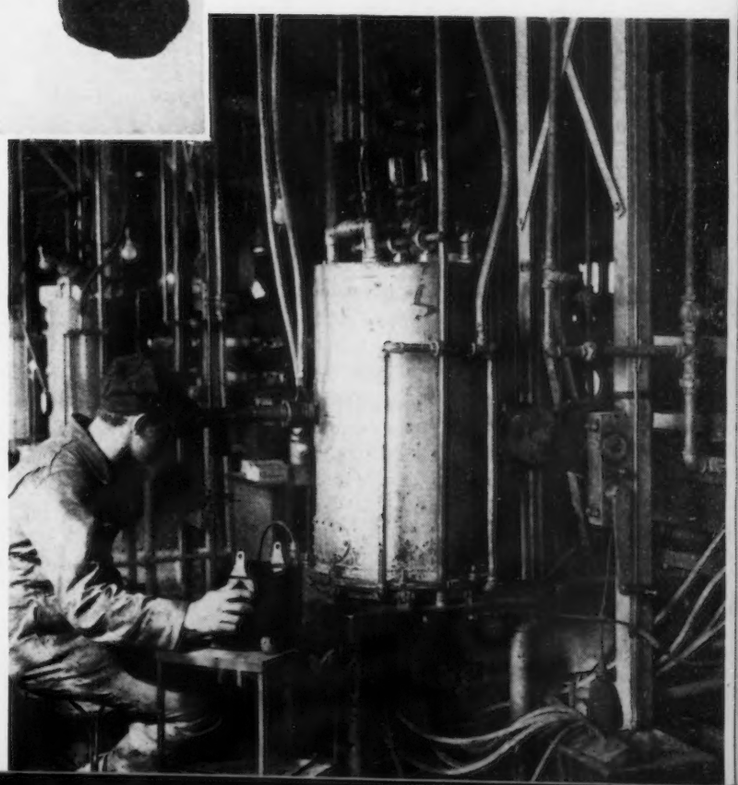
Another obstruction consists in a lack of ductility either in the surface of a compound powder or throughout the body of a single particle. The ductility is affected by cold work or by impurities, or it may be one of the properties of the substance itself. For instance, hard tungsten carbide particles will not adhere to each other unless they are surrounded by a thin film of a more ductile metal such as cobalt, which aids extensively in pressing the fine powder. Some metal powders are prepared by mechanical means, such as stamp mills, or ball mills, and the particles become burnished or work-hardened, thus decreasing their ductility and ability to flow into the gaps when the compact is under pressure in the die. Wollaston warned against burnishing even the very ductile platinum powder, a condition which hampered the formation of good welds between particles. Tungsten powder is of itself very non-ductile compared with copper powder. Thus a lack of ductility will then hinder the attainment of the eventual solid metal.

Another very important obstruction consists in mechanically intermixed solid impurities, especially where fine powders are involved. This has necessitated the installation of expensive air-conditioning equipment in a number of powder-metallurgical plants making hard carbides, where the particle size is of the order of several microns and atmospheric dust must be entirely eliminated.

Although these are not all of the obstructions which the powder metallurgists must face, they present a gloomy picture and make the success of the process look doubt-



HARD carbide powders: Ingredients are shown at bottom, left to right, WC, TaC, Co. The milled powder at top having a particle size of only several microns or less is pressed into a blank and sintered. Shrinkage amounts to 46 per cent in volume, and in this case is aided by liquid surface tension of the molten binder. Sintered piece on right has practically theoretical density.



RIGHT

VACUUM sintering furnace: All parts of furnace must be water cooled because of the high temperature required for sintering tantalum. The temperature is controlled within a very narrow limit by optical pyrometers which are frequently checked against a standard. The final vacuum is of the order of only several microns.

ful. They at least show the importance of the properties of the single particle as a building block for the construction of macro pieces. They have been overcome to a very remarkable degree as shown by many of the commercially successful products on the market today.

Sintering Phenomena Interesting

The third phase of powder metallurgy, namely, the sintering or heat-treating of the pressed piece, presents one of the most interesting phenomena. The most obvious change which takes place during the sintering operation which strikes the eye is the fact that the pressed compact often changes its shape and volume by a considerable amount, usually shrinking but sometimes expanding. In some cases the shrinkage is only a matter of a fraction of a per cent; in others, for instance the hard carbides, the shrinkage will amount to as much as 45 per cent by volume. Often the sintering temperature is considerably below the melting point of any constituent in the compact, and yet sufficient shrinkage occurs to give practically solid metal.

In order to attempt to explain this phenomenon, it is necessary to go back to the properties of the single particle. If a small particle of gold, which is chosen as an example because it is not subject to oxidation, is melted to form a liquid bead, its surface will appear perfectly smooth. However, when it freezes, the surface wrinkles, due to contraction upon solidifying. Under the microscope the bead looks like a dried-up apple with ridges and creases over the surface. After subjecting the wrinkled bead to a temperature several hundred degrees below the melting point of gold, it will not be long before the wrinkles will have completely smoothed out, indicating that there is a powerful force operating along the surface. The hollows are filled in and the high points are smoothed off. The time required, even at this low temperature, is a matter of only a few hours, which is quite comparable to the sintering time now used in many cases in commercial practice, and, therefore, makes the analogy all the more convincing.

Using gold as the example again, it can be shown that small triangular gold crystals formed by the reduction of gold chloride by aldehydes will become rounded when heated to a temperature considerably below its melting point. Under magnification the crystals appear as perfect little triangles, but at 900 deg. C. (1652 deg. F.) for instance, the corners gradually round off and eventually the triangles assume the shape of perfect little spheres. It is difficult to admit that at several hundred degrees below the melting point the surface melts without the inside melting. The temperature makes the metal sufficiently plastic so that the forces operating along the surface can stretch the surface out and smooth it down. To date little is known about the surface tension of solids compared with that which is known concerning surface tension in the liquid state.

From these crude examples a theoretical picture can be drawn to explain the shrinkage which goes on during the sintering of a pressed powder compact at temperatures below the melting point. When two particles are pressed together so that at certain points the metal of one is in contact with that in the other, the intervening surface films having been ruptured, there will be a deep crevasse which is gradually filled up by the action of the surface tension. In other words, the surface tension acts as a "zipper." This zipper action proceeds out in a circular fashion from the point of contact, and as adjacent circles eventually meet they may catch some solid impurities or even gaseous impurities in a little pocket. Therefore, the first part of the sintering operation should be taken rather carefully so that these impurities may be removed before much shrinkage takes place. With this going on throughout the whole mass it now becomes apparent why shrinkage should be expected on a large scale, and also why there should be more shrinkage in one case than in another. Carrying the idea still farther, it can be expected that with larger amounts of surface energy—meaning smaller particles with much more surface—a great deal more shrinkage should take place. Grain growth may accompany the shrinkage, the smaller grains being absorbed into the larger ones; but it seems almost impossible with this picture in mind to see how grain growth alone could account for this phenomenon, or even that the vapor emanating from a metal below its melting point could fill in a gap or pull two particles together. It appears as though the surface tension of a solid is the prime factor in causing shrinkage, and is, therefore, the best aid in obtaining a solid piece of metal. Elevated temperatures simply allow it to operate in a reasonable time.

Tantalum Technique Difficult

In order to illustrate how some of these theoretical considerations are applied in the practice of powder metallurgy technique, the preparation of solid tantalum from its powder may be briefly described. Of the many methods for preparing metallic powders, the one used for the preparation of tantalum is considered one of the most difficult. It is made by the electrolysis of a fused salt, potassium tantalum double fluoride. The electrolysis is carried out in an apparatus consisting principally of an iron pot that acts as the cathode, and a large carbon anode which can be moved up and down as the electrolysis proceeds. The salt freezes next to the surface of the pot, so there is very little contamination by iron. A fine net-work of metallic tantalum crystals is built up and the salt gradually solidifies in this net-work which carries the current. In an electrolysis of this sort the action which takes place at the anode is the liberation of fluorine which forms a bluish gaseous film around the graphite anode, stopping the electrolysis. In order to prevent this an oxygen-carrying compound may be added to the bath, so that oxygen is liberated at the anode, thus gradually burning it up, but nevertheless preventing the formation of fluorine.

When the pot has become full the anode is withdrawn, and upon cooling the cake shrinks so that it can be easily removed. The electrolysis cake consists of solid salt interlaced with a fine net-work of metallic crystals. It must be broken up, pulverized and air-separated, followed by an extensive washing process to free most of the salt from the heavy metal. The final tantalum powder then contains a small percentage of remaining salt, 50 to 150 volumes of hydrogen, 0.05 to 0.20 per cent carbon, and less than

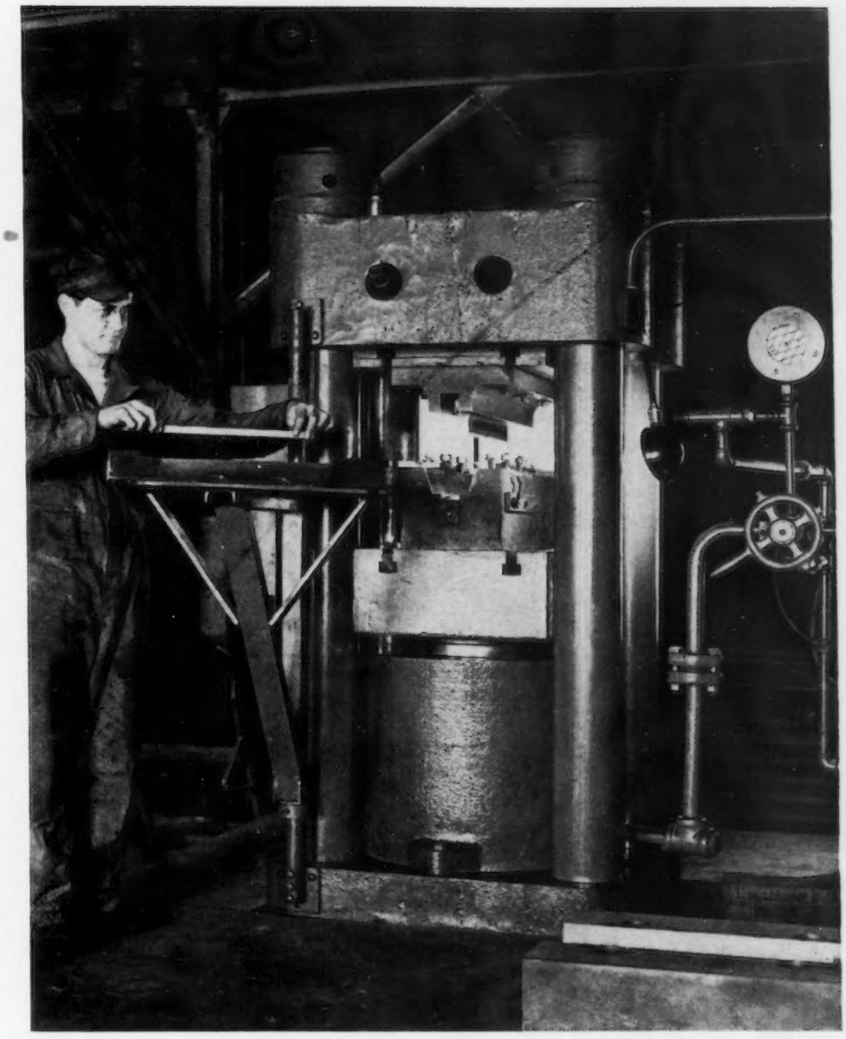
0.02 per cent iron. This is the starting point for preparing the solid tantalum.

It will be noted in the photograph that the powder has the obstructions described in the theoretical consideration, mainly odd shapes and sizes. The pulverizing and beating action necessary to break the salt away from the metal crystals has deformed them, thus work-hardening them to some extent. The remaining solid impurities as well as the gaseous ones must be removed during the sintering process. In order to remove the carbon, magnesium oxide in stoichiometric relation to the carbon is mixed with the powder. It is believed that during the sintering process some of the tantalum metal reacts with the magnesium oxide, liberating magnesium in the form of a vapor which is removed by the vacuum pumps, and forming tantalum oxide within the porous ingot. This oxide then soaks through the metallic particles being appreciably soluble in the metal itself, and gradually reacts with the solid carbon to liberate carbon monoxide.

The tantalum powder is pressed into ingots weighing between 2 and 3 kg. under a pressure of the order of 50 tons per sq. in. This produces a bar sufficiently strong to withstand firm clamping between molybdenum screws embedded in heavy water-cooled copper terminals in the vacuum furnace. The ingot is heated by its own resistance, and because of this method of heat treatment, the cross section of the bar is limited. The heat gradient developed between the center and the surface is of the order of several hundred degrees, so that when the current reaches a value short of that necessary to melt the core, the surface of the ingot will still be several hundred degrees below the melting point.

A number of things happen during the course of the first sintering operation. First, at a low temperature, the hydrogen is evolved very rapidly; moisture and gases occluded on the surface of the metal are driven off; and, a little later, the remaining salt impurity melts and is gradually vaporized. Care must be exercised in this first stage of the heat treatment so that gas is not evolved too fast while the salt is melting; otherwise, the bar might puff or even split. As the temperature is raised the reaction for the removal of the carbon takes place, and carbon monoxide again drops the vacuum. At a still higher temperature, dissolved oxygen and dissolved oxide gradually are evaporated until the metal becomes quite pure. It is evident that in order for all of these reactions to take place with the necessity for removal of impurities, the bar must be porous, and that it cannot be closed up until the impurities are completely out. For this reason the powder must not be too fine. Otherwise the porosity would be closed up by the action of the surface tension already described in the theory.

The density of the heat-treated bar is approximately 12½ gm. per cu. cm., whereas the density of solid tantalum is 16.6 gm. per cu. cm. Thereafter a severe hammering operation takes the place of the action which fine grains would have in closing up the pores. This forging must be done cold because tantalum when heated has a very powerful affinity for all of the common gases which render the metal hard and unusable. During the second heat treatment the porosity is almost completely removed by the zipper action of the surface tension. The cold-working from the forging operation aids in recrystallization. The density of this metal is substantially equal to that of the solid melted material; it has the polygonal crystal structure of a pure metal that has been melted, cast, worked and annealed. From this point on the tantalum may be worked by any of the known methods into sheet, wire or tubes.



HYDRAULIC press: The segment die has been withdrawn from the press in order to remove the pressed tantalum bar. Pressures of the order of 50 tons per sq. in. are required to give the bar sufficient strength for handling.

Flame Hardening With

IMPROVEMENTS OF AIR-GAS BURNERS: Improvements to obtain higher surface temperatures may be obtained from two separate viewpoints. For the multiple port type burner head, equipment serving higher pressure mixtures to the burner head are advantageous. Apparently the higher port velocities resulting increase both the turbulence of the air-gas mixture and the heat transfer rate to the surface being heated.

The mixture pressure available from proportional mixing blowers or inspirators is relatively low, being of the order of 1 or 2 in. water column. As a result improvements may be obtained by reducing the frictional resistance of flame ports to a minimum. This is readily accomplished by using relatively large port sizes for natural gas (No. 45 or larger) and by using relatively shallow port depths. The alloy grid of burner No. 8 was only 1/16 in. thick and operated without flashback at all natural gas inputs from 15,000 to 40,000 B.t.u. per hr.

Close port spacing is also an advantage in obtaining a high rate of heat release. In fact, spacing may be used which is so close that the outer flame cones merge.

Heat resisting alloy steel or refractory tunnels are required to insure a reasonable service life for the burner head.

The final design adopted for burner No. 8 is shown in Fig. 4. The tests of this burner at higher mixture pressures showed that a limit had been reached in the amount of natural gas which could be burned with this head. The results calculated indicate that when a port velocity of about 80 ft. per sec. was reached the flames lifted from the ports and tended to burn outside the tunnel. Higher port velocities could probably be obtained when using manufactured gas due to its higher flame velocity. The turbulence caused by the tunnel explains in part the high port velocities obtained. It is interesting to compare the velocity obtained with that for an atmospheric type burner operating at approximately the same primary air-gas ratio. The velocities at which flames lift from the ports of atmospheric type burners are given at 2.5 to 3.5 feet per second.[2]

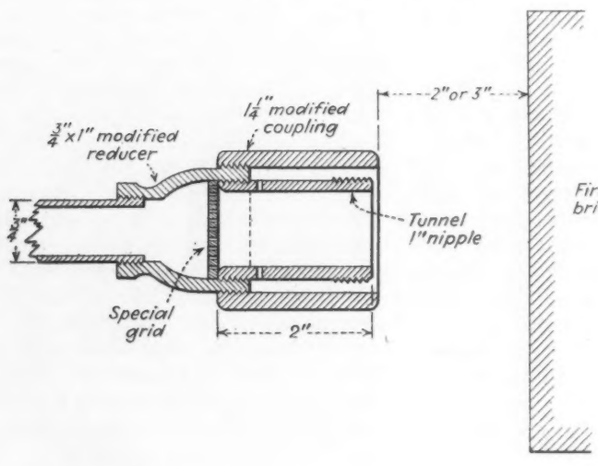
USE OF OXYGEN: Where the area to be heated is limited in size, as for example in hardening a piston pin bearing, more concentrated heat release can be obtained by using gas, air and oxygen mixtures, or in an extreme case, gas and oxygen mixtures. In fact these higher temperature flames could be applied wherever limited space prohibited the installation of multiple air-gas burners. Another typical example of hardening in confined spaces would include the heat treatment of gear teeth.

Indications at the present time are that surface temperatures which are sufficiently high for these operations may be obtained by using oxygen, air-gas mixtures rather than straight oxygen-gas resulting in considerable savings in cylinder oxygen consumption.

Proportional mixing blowers and inspirators have been used for the purpose of pre-mixing gas and oxygen with some disastrous results. In one case the flashback which occurred cracked the casting of a blower mixer. No damage was done to steel and iron inspirators, but the explosions obtained upon flashback were very intense. As a result, work with oxygen, and gas mixtures was continued using a small size mixing tee just in back

[2] Industrial Gas Series, Combustion, Third Edition, p. 109.

FIG. 4—Final design adopted for burner No. 8. Grid and tunnel made of oxidation resisting alloy.



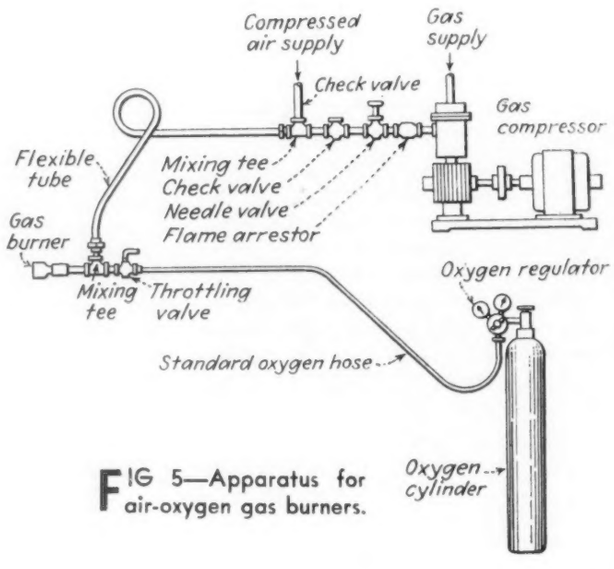


FIG 5—Apparatus for air-oxygen gas burners.

City Gas

By J. M. KRAPPE
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—Continuation of data presented last week. Herein, attention is directed toward improvements in air-gas burners, use of oxygen, and test results with gas and cylinder oxygen mixtures.

of the burner head for the purpose of introducing oxygen. No flashback difficulties were experienced with this arrangement. However, light weight swing check valves were used to prevent either the air or oxgyen from traveling back into the gas line. Higher mixture pressures used also eliminated flashbacks for some of the burners. These swing check valves effectively protected the meters from damage when back-firing was obtained during the runs with proportional mixers using pressure oxygen from cylinders.

When working with air, gas, and oxygen, the air-gas mixture was first adjusted to obtain a soft, blue, large volume flame at the burner head. Then the oxygen valve was opened gradually until sharp flames, having distinct inner cones which burned on the flame ports were obtained. After obtaining a flame which would remain on the ports it was often possible to increase the gas and air input after which a second adjustment of the oxygen input was made.

The success in obtaining smooth operation with gas, air, and oxygen is attributed to the high mixture pressures developed in back of the burner head. It is well to remember that high mixture pressures with consequent high port velocities would operate to prevent flashback.

The general arrangement of the mixing equipment used is shown in Fig. 5. It was also found that a single compressor could be used to supply a mixture of gas and air by placing a throttling valve and a suction tee on the inlet line to the compressor. The negative pressure developed at the inlet inspirated air from the atmosphere mixing it with gas in the compressor. The mixing method is thus similar to that used in the Selas pre-mixing system, except that the Selas units available have higher capacities and serve air-gas mixtures at pressures of the order of 1 lb. per sq in. to burner tips.

Safety devices used included both the swing check valve and flame arrestors placed in the mixture line and on the air inlet. The size of the compressor should be selected on the basis of the total gas and air requirements, allowing 9 cu. ft. of air for each cubic foot of natural gas burned. Compressor outlet pressures of 4 lb. per sq. in. appeared to be adequate for most of the burners tested including the allowance for pressure drop in mixing tees and pipe lines.

TEST RESULTS—AIR, GAS, AND OXYGEN MIXTURES: The maximum temperatures attained on a refractory brick ranged from 2120 deg. to 3180 deg. F. depending principally on the gas input to the burner and amount of cylinder oxygen injected into the air-gas mixture. These are the equilibrium temperatures obtained by allowing enough time for the surface of the refractory to be heated to its maximum temperature. For any given gas input the amount of oxygen which would result in short, sharp flames was limited to a narrow range. In general, as the gas input to a given burner was increased, larger proportions of oxygen were required to obtain concentrated heat release.

Burner No. 11, a blow-pipe designed for air-gas mixtures, was damaged when operated with 99 per cent of cylinder oxygen in the air-oxygen mixture. A surface temperature of 3180 deg. F. was reached, but after 3 min. of operation, the brass head began to melt. Heat-resisting alloy heads are required when operating at temperatures above 2600 deg. F.

Burners not equipped with flame retention devices will give satisfactory flames when cylinder oxygen is introduced into the air-gas mixture. A typical example is that of Burner No. 7, a ribbon type burner, which could not produce a sharp flame with natural gas and air alone but which performed very satisfactorily when using 26 per cent of cylinder oxygen in the mixture. The surface temperature possibilities for Burner No. 7 were not exhausted. If alloy steel construction were used in place of bronze, the gas and cylinder oxygen input could be increased without damaging the head.

Burners equipped with flame retention ports around the main flame port produced heated areas with a hot spot at the center. The surface temperatures reported are those of the central hot spot. Typical examples are burner No. 11 and burner No. 16. Burner No. 17, of similar construction, produced a relatively large heated area but there was evidence of cold streaks or spotty heating.

For all of the burners tested except No. 9, the cylinder oxygen was introduced into a mixing tee directly in back of the burner head. Burner No. 9 was a special design in which the jet of oxygen was introduced directly into the air-gas flame using a No. 60 orifice and an oxygen pressure of 10 lb. Compared to the other burners tested, the flame was extremely noisy and the surface temperatures developed comparatively low. Table IV summarizes the test results obtained using air, gas and oxygen mixtures.

The wide range of surface temperatures obtainable may be visu-

alized from Fig. 6 which also summarizes the results for air-gas and gas-oxygen burners.

TEST RESULTS—GAS AND CYLINDER OXYGEN MIXTURES: Surface temperatures in excess of the melting points of iron and steel were obtained using burners and torches designed for oxygen and gas. All of the burners tested were furnished with burner heads capable of resisting oxidation and excessive scaling at high temperatures. However, it was necessary to avoid placing these alloy steel heads too close to the refractory surface. In one test run, the hot gases were reversed in direction when firing into a depression in the refractory resulting in a slight fusion of the alloy tip.

It is interesting to note that these temperatures were obtainable when using relatively low gas and oxygen pressures. The maximum gas pressure available from the small gas compressor was 4 lb. per sq. in. In previous research work on welding with city gases,[3] gas and oxygen pressures as high as 25 lb. were required, probably due to the fact that the conventional welding torch was initially designed for use with compressed gas in cylinders. It is probable that the small diameter internal passages and the small diameter tubing used accounted for considerable pressure loss. In this experimental work there was little pressure drop in the piping, most of the pressure energy being used in the mixing tees.

As shown in Table V, the metered usage of cylinder oxygen was less than the theoretical requirements for natural gas. The stoichiometric or theoretical requirement is roughly 2 cu. ft. of pure oxygen per cu. ft. of gas burned as compared with actual ratios of 1.5 to 1. It is apparent that the additional requirements for combustion of the natural gas were supplied by diffusion of air from the atmosphere into the flame. The flames appeared to be oxidizing to steel; consequently if scaling is a factor in actual practice of selective heating, excess gas may be used with some sacrifice in the surface temperature obtained.

Burner No. 13, a hand torch designed for low pressure city gas and oxygen produced surface temperatures in excess of 3000 deg. F. without the use of a gas compressor. Uniformly heated areas from 1 in. to 1.5 in. in diameter were easily obtained depending on the gas input used.

Burner No. 14, a fish-tail tip, developed a maximum surface temperature of 3250 deg. F. at a rating of 40,000 B.t.u. per hr. The uniformly heated area was oval in section having dimensions of 1 in. by 1½ in. This flame melted a groove in a chrome brick. The melting point of this brick is given as 3700 deg. F., but apparently the high velocity of the hot gases against the refractory surface resulted in fusion taking place at 3250 deg. F.

Burner No. 15, a circular tip having a central port 1/16 in. in diameter, with a flame retention ring surrounding this port produced maximum surface temperatures between 2500 deg. and 3000 deg. F. The tip operated at a visible light red heat. The area heated consisted of a central white hot spot around which an area 1½ in. in diameter was heated to a visible red. Many of the burners equipped with flame retention rings produced this type of heated area. A depression was produced in the surface of a fireclay refractory whose melting point is given as 3200 deg. F.

Descriptions of burners and mixing equipment for the selective heating tests are listed below:

(A) Natural Gas-Air Burners:

(1) Sticktite ¾-in. I.P.S. Maxon Premix or Eclipse Fuel Engineering Co.

(2) Sticktite ¾-in., firing into a 2-in. alloy steel tunnel 5½ in. long insulated with 1½-in. high temperature insulation.

(3) McKee blast head No. 70, ¾-in. I.P.S. Eclipse Fuel Engineering Co.

(4) McKee counter-sunk Lava tip No. 3N, 1½-in. I.P.S. Eclipse Fuel or American Lava Corp.

(5) McKee Ferro-Fix ¾-in. I.P.S.

(6) McKee "No Blow" blast tip No. 3K, ¾-in. I.P.S.

(8) Special Gas Engineering Laboratory design with punched circular ports. Consists of reducing coupling ¾ in. by 1 in. and 1 in. close nipple which serves as a combustion tunnel. The punched grid is 1½ in. in diameter, port size 0.079 in. staggered, Harrington & King designation, 47 holes per sq. in. The grid is made of pure nickel sheet 1/16 in. in thickness.

(B) Burners Used for Mixtures of Natural Gas, Air and Oxygen:

(7) McKee Ribbon Tip No. IRT, ⅜-in. I.P.S. Eclipse Fuel Engineering Co.

(9) Elbow gas burner, nozzle mixing type 1½-in. I.P.S. North American Manufacturing Co. Air-natural gas mixture supplied to burner from an inspirator using a gas pressure of 5-in. water column. Oxygen mixed in at nozzle through a No. 60 orifice

[3] Research Series No. 41, Engineering Experiment Station, Purdue University.

TABLE III

Representative Test Results Using Air, Gas, and Cylinder Oxygen

Burner No.	Gas Input, B.t.u. per hr.	Per Cent Cylinder Oxygen in Air-Oxygen Mixture	Pressures, lb. per sq. in. Air—Gas	Pressures, lb. per sq. in. O_2**	Surface Temperature, Deg. F.	Area Heated, In.
7	28,800	26	1.2	5	2500	Oval 1½ x 2½
	30,000	27	1.4	5	2700	1½ x 2½
11	16,200	27	4	6	2520	Circle* 1 x 3½ diam.
	37,200	57	4	5	2600	1 x 4 diam.
	91,500	99	4	4	3180	2½ x 6 diam.
14	30,350	68	2.3	6	2550+	Oval 1½ x 2½
16	32,200	30	0.9	6	2570	Circle* 1½ x 4 diam.
	32,600	30	1.4	6	2650	1½ x 4 diam.
17	26,000	11	1.0	6	2325	Circle 4 diam.
	42,000	20	2.3	..	2450	5 diam.
	40,400	17	2.6	4	2475	5 diam.
9	37,400	15	0.04	10	2120	1 to 3*

*Small diameter refers to inner hot spot, large diameter to total area heated to visible color in daylight. Burners with a number of flame retaining ports around the central port produced this effect.

**Pressure at outlet of cylinder regulator. Oxygen pressure further reduced at burner head by means of valve in oxygen line.

with oxygen pressure from 7 to 14 lb. per sq. in.

(11) Stand blow pipe No. INS. American Gas Furnace Co.

(12) Stand blow pipe No. ONS. American Gas Furnace Co.

(16) Machlet Tip No. 63, ⅜-in. I.P.S. American Gas Furnace Co.

(17) Machlet Tip No. 422, ¾-in. I.P.S. American Gas Furnace Co.

(C) Burners Designed for Gas-Oxygen Mixtures:

(13) Oxygen-gas blowpipe (hand torch) No. 583E. American Gas Furnace Co. Central port 3/32-in. diameter with flame retention ring.

(14) Oxygen-gas fishtail burner, No. 1081A. American Gas Furnace Co., ⅜-in. I.P.S. Nine ports No. 62 drill, with smaller flame retention ports surrounding these ports.

(15) Oxygen-gas tip with circular port and flame retaining ring. No. 814D, American Gas Furnace Co., ¼-in. I.P.S. Central port 1/16-in. diameter.

(D) Mixing Equipment and Accessories:

(1) Maxon-Premix Blower-Mixer Catalog No. 0. Rating 100 cu. ft. natural gas per hr.; maximum mixture pressure 2-in. water column. Mason Premix Co., Muncie, Ind.

(2) Gas or air compressor, capacity 200 cu. ft. per hr. measured at 60 deg F., 30 in. Hg. Maximum outlet pressure, 4 lb. per sq. in. Ensign-Reynolds Co., New York.

(3) Mixing tees. Ordinary galvanized iron pipe tees, ⅜ and ½-in. pipe sizes.

(4) Oxygen cylinder regulator with pressure gages. Alexander Milburn Co., Baltimore.

(5) Back pressure valve. Light swing check valves, 1-in. I.P.S. Connelly Iron Sponge & Governor Co., Chicago.

(6) Flame Arrestor, ⅜-in. I.P.S. American Gas Furnace Co.

(7) Precision flow control valve, numbered, ½-in. I.P.S. Mehler Precision Valve Co., Pittsburgh.

(8) Flow control needle valves, ⅜-in. I.P.S. Jenkins Valve Co.

Summary

A review of the fundamentals of the hardening operation indicates that the rapid water quench produces the hard, martensitic surface structure desired in flame hardening operations on low carbon steels. Required surface temperatures before quenching depend on the type of steel being hardened which may be anywhere in the region from 1500 deg. to 2400 deg. F.

This phase of the investigation of burners for selective heating covers the operation and application of natural gas-air burners and compares surface temperatures reached by air-gas burners and burners using supplementary oxygen.

(1) Surface temperatures of 2100 deg. F. have been reached using gas and air mixtures. Surface temperatures increase rapidly as the gas input to a given burner is increased, being limited by the gas (and air) input at which flames lift from the flame port. It is suggested that multiple air-gas burners may be used for flame hardening to obtain higher production speeds.

(2) Surface temperatures of 2700 deg. F. have been reached by mixing 27 per cent of oxygen in the air-oxygen volume used for combustion.

(3) Surface temperatures of 3250 deg. F. have been reached when using cylinder oxygen and gas. This temperature is in excess of the melting point of iron and steel and was obtained using gas at pressures of only 2 lb. per sq. in.

(4) The use of mixing equipment serving high mixture pressures to the burner head has facilitated the production of higher surface temperatures and improved burner operating characteristics.

Ed. Note:—Next week another article will be presented on the use of gas for surface hardening. It will be concerned with the design of a burner tip for flame hardening cam shafts. All these data were presented to the Mid West Industrial Gas Sales Council of the Industrial and Commercial Gas Section, American Gas Association.

TABLE IV

Test Results Using Cylinder Oxygen—Natural Gas Mixtures

Burner No.	Gas Input, B.t.u. Per Hr.	Ratio Cylinder Oxygen to Gas	Pressures Gas	Pressures Oxygen*	Surface Temperature, Deg. F.	Area Heated, Diameter in In.
13	8,400	1.5 to 1.0	6 in.	3 lb.	3040	1
(hand torch)	16,000	1.2 to 1.0	6 in.	3 lb.	2830	1¼
	11,500	1.3 to 1.0	4 lb.	4.8 lb.	3030	1½
	14,000	1.1 to 1.0	4 lb.	4.3 lb.	2720	1½ oval
14	5,940	2.0 to 1.0	6 in.	3.6 lb.	2830	1 x 1½
(fishtail tip)	11,800	1.5 to 1.0	4 lb.	2.5 lb.	3000	1 x 1½
	37,800	1.4 to 1.0	1.6 lb.	5.5 lb.	3250	1 x 1½
	41,500	1.2 to 1.0	1.8 lb.	5.0 lb.	3250	1 x 1½
15	4,030	0.9 to 1.0	4 lb.	4.0 lb.	2480	hot spot ½
(circular tip)	5,950	1.7 to 1.0	4 lb.	3.3 lb.	2980	overall 1½

*Pressure at outlet of oxygen cylinder regulator. This pressure was throttled further by means of a valve at the mixing tee directly in back of the burner head.

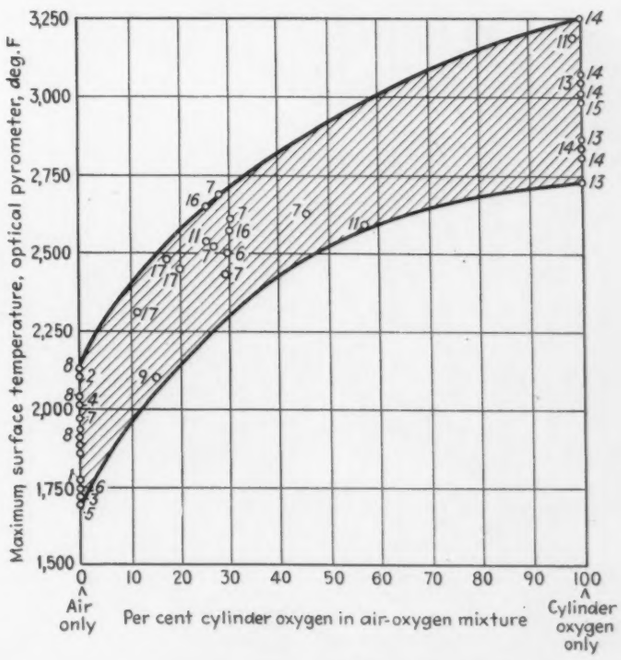


FIG. 6—Range of surface temperatures obtainable with burners for selective heating using natural gas. Burner number indicated opposite point.

Heat Treatment With

THE salt bath has a distinct use in the heat treating room of every manufacturer. These may be divided into two distinct types, the baths used for hardening and those used for tempering.

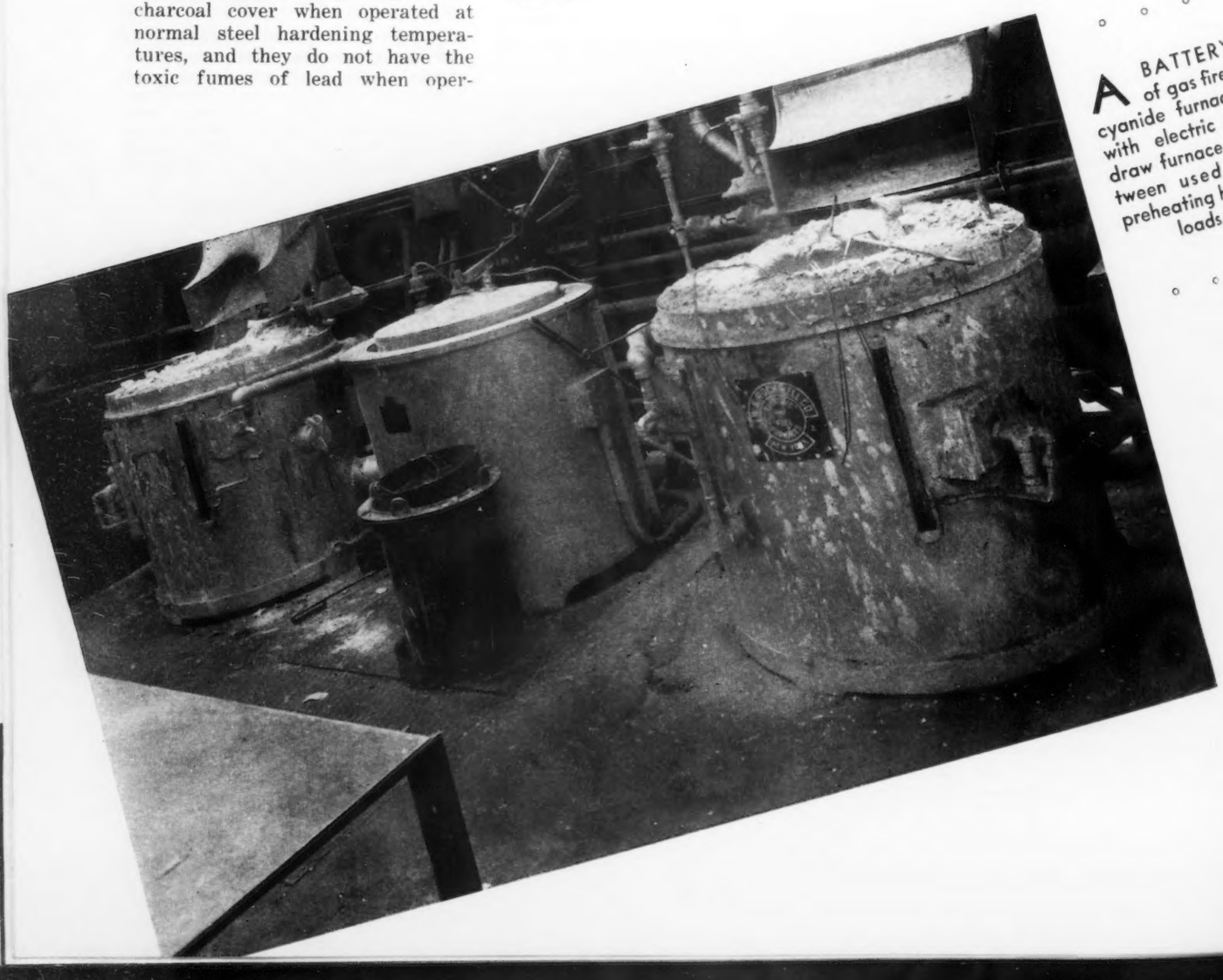
Hardening Baths

The baths used for hardening and annealing have three distinct ranges. The normal hardening temperatures, the high-chromium high-carbon steel range, and the high speed steel range. These hardening baths have distinct advantages over lead baths, because the salts do not adhere to the steel as does lead, which results in difficult cleaning operations; they require no charcoal cover when operated at normal steel hardening temperatures, and they do not have the toxic fumes of lead when operated at temperatures of 1600 deg. F. or higher. However, they are not as rapid heating as the lead baths are.

The baths used for normal temperatures are of three general types. The first is a mixture of alkali carbonates and chlorides and may be used from 1200 deg. F. to 1650 deg. F. The second is a mixture of alkali chlorides and may be used from 1400 deg. F. to 1650 deg. F. Both of these baths are usually used with an addition of about 2 per cent of borax, as otherwise they become contaminated with iron oxide which will cause some decarburization of the steel being treated.

A bath composed of barium, sodium and potassium chloride may be used from 1200 deg. F. to 1800 deg. F. if a graphite cover is maintained on it when used at the higher temperatures.

Many attempts have been made in the past 25 years to produce a satisfactory bath for the treatment of high speed steel. The original bath of barium chloride was received with open arms until it was found that this bath operated at 2350 deg. F., was extremely corrosive on the pots, and also at-



A BATTERY of gas fired cyanide furnaces with electric air draw furnace between used for preheating heavy loads.

Salt Baths

By LLOYD E. RAYMOND
Fairfield, Conn.

—Continuation of data presented in the issues of April 3 and April 10. Herein, attention is directed to salt baths for hardening and tempering, operation of salt baths, and types of equipment in general use.

tacked the thin edges of the tools being treated in it. The result was that it generally fell into disuse.

In the past few years a suitable silicate bath has been developed for the treatment of high speed steel, both the standard tungsten steels and the molybdenum high speed steels. The composition of the high speed steel hardening bath is not available for publication, but the mechanics of the operation are as follows:

The high speed hardening is done in a unit of three distinct baths. The first one is a preheat bath which is operated at 1500 deg. F. From this bath the work is transferred to the high heat bath until the predetermined time is reached, after which it is transferred to the quenching bath which is maintained between 1200 deg. F. and 1300 deg. F. The purpose of this bath is not only to cool the tools to this temperature but to help remove the high temperature salt which is carried over on the tools and to facilitate the subsequent washing operations. The tools may then be cooled in air or oil quenched.

The Cyanide Reheat

The 30 per cent sodium cyanide bath is extensively used for reheating carburized work and for hardening the high and medium carbon steels, particularly those of the oil hardening types. This bath has the advantage over the other types of hardening baths in that no decarburization whatever will take place during the heating cycle. This is extremely important when no grinding is to take place on working surfaces after the hardening process.

This bath is of great advantage in treating the newer air hardening steels that are hardened from the range of 1500 deg. to 1575 deg. F. These steels may be heated in the bath without preheating, when in section of less than 5 in. in thickness, and air cooled after heating. The cyanide prevents decarburizing during heating and cooling, as there is a coating of the bath on the steel throughout the air cooling process. Of course, no scaling occurs to cause any dimensional change and the advantages of this type of steel are fully realized.

In treating the oil hardening die steels in the cyanide bath for hardening, the same coating on the tool slows the rate of cooling slightly so that it is not necessary to heat the oil when intricate sections are used, and the result is a hard surface, no scaling, and minimum loss due to cracking.

The cyanide reheat gives the usual gear steels a slight increase in surface hardness over the conventional methods of gear hardening, and it has been claimed that gears which have been heated in the cyanide bath are less subject to tooth pitting under severe service than gears hardened direct from the pack or in muffle furnaces.

There are two disadvantages to the cyanide reheat for a hardening bath. Certain machine parts are carburized and then have a section of the case removed by machining before hardening so that machining operations may be performed during assembly, and then hardened. These types of machine parts may not be hardened from the cyanide reheat as they will pick up sufficient hardness where not desired to render them unfit for the machining operation during assembly.

Very thin springs cannot be satisfactorily hardened from the cyanide bath due to a nitrogen pickup during heating, which renders them quite brittle. The nitrogen will not react to the subsequent spring tempering operation as readily as the carbon, and an unsatisfactory spring results. This layer of nitride is so thin, however, that it is not at all objectionable in quite heavy springs.

Tempering Baths

The tempering baths may be divided into two classes, those for low temperature tempering and those for high speed steel tempering. The low type are composed of either alkali nitrates, or a mixture of alkali nitrates and nitrites. These baths have melting points from 285 deg. F. to 585 deg. F., and may be used from 20 deg. above their liquefaction points up to about 1100 deg. F. if any nitrite be present, and up to 1200 deg. F. if composed entirely of nitrates.

These baths, particularly the bath composed of potassium nitrate and sodium nitrite, are well adapted for use in heat coloring of steel. By using polished articles, excellent colors may be obtained with little effort.

The cyanides are widely used for tempering hardened high speed steels. The usual practice is to harden and temper the high speed tool and then, after grinding, to

heat the tool in a cyanide bath for a period of time. This second treatment actually nitrides the surface of the steel, giving it a greater hardness. Extensive studies of this process were reported at the 1939 National Metals Congress by Messrs. Morrison and Gill[3] and by Messrs. Cohen and Kor.[4]

The usual salt bath used for treating the high speed steels is 53 per cent NaCN and 47 per cent KCN, although some prefer to use a mixture of sodium cyanide and carbonate which is of sufficient fluidity to be used at the temperatures usually employed, about 1050 deg. F. These baths may also be used for nitriding alloy steels which are capable of being nitrided.

Operation of Salt Baths

These salt baths may be used as conventional hardening and tempering baths and the majority of them are so employed. However, since the interest has become so keen in the method of interrupted quenching usually called austempering, a new and important field for the use of the salt bath has been opened.

The steels, when austempered, are generally heated to hardening temperature in a lead bath and then quenched into a hot salt bath from 450 deg. F. to 850 deg. F., depending upon the service demanded from the material being treated. If a salt bath is used for heating at the high temperature, care must be exercised that the dragout from the high temperature bath does not increase the melting temperature of the lower temperature bath due to contamination. The cyanide must always be kept away from the liquid nitrates or nitrites lest severe explosion occur.

It has been found that cast iron quenched to a temperature of 650 deg. has much greater wear resistance than cast iron that has been hardened from a cyanide bath as previously outlined.

The pot furnaces used may be oil, gas or electrically heated. The electric resistor furnaces are not recommended for heating pot furnaces using salts as any salt which may leak into the combustion chamber will attack the resistor and nearly every pot failure will result in resistor failure with resultant high maintenance cost.

The electric electrode furnace has proved quite satisfactory for salt baths. These types of furnaces pass an alternating current through the bath itself and the resistance of the bath converts the electrical energy into heat which can be closely controlled by automatic means. The electrode furnace has one disadvantage when used only intermittently as the salt should always be kept molten, and when the bath is not in use the temperature is usually lowered to about 1200 deg. F. This is not economical when the bath is not in constant use. However, this is an excellent type of furnace for continuous operation.

The oil and gas furnaces should be of the type fired from the top tangentially, being vented below the bottom of the pot holding the salt. In this way the cold salt is melted from the top downward thereby decreasing the amount of spattering that may occur, particularly during humid weather.

The type of pots in use include heat resisting alloy castings, steel castings, pressed steel, calorized steel, and clad pots. The most satisfactory for cyanide is the 35 per cent nickel, 15 per cent chromium, cast heat resisting alloy pot. For the salt baths that are of high chloride content, the heavy cast steel pot is most economical, as the chloride baths are much more corrosive to the heat resisting alloys than is the cyanide bath.

A ceramic pot has been developed for use in connection with the baths usually employed for working in the ranges of 1700 deg. to 2400 deg. F. This pot is not very long lived in the fuel fired furnaces due to the poorer structural properties of the ceramics as compared to the metals, but it is excellent for use at these higher temperatures with the electrode types of electric pot furnaces, as in these furnaces there is no heating from without the pot and it can be firmly supported.

Temperature control of the pot furnaces is of great importance as proper temperature control will insure correct hardening practice and greatly lengthen the life of pots. With the electrode type of furnace, temperature control is relatively simple, requiring only a throttling device to decrease the input as the bath approaches the desired temperature to prevent overshooting.

With the fuel fired and electric resistor type furnaces, the control becomes more complex due to the indirect heating used. With these furnaces, if control be only in the salt itself, the combustion chamber on the outside of the pot may vary as much as 1200 deg. This results in considerable surge in the pot temperature which may vary 50 deg. or even more, a very undesirable condition when accurate heat treating is wished. In addition to the erratic results that may be obtained, pot life will be reduced due to the excessive temperatures in the combustion chamber. The preferred type of control is one in which the pyrometer is affected by temperature changes in both the combustion chamber and in the pot. With this type of control, the pyrometer has two control points: one, the temperature desired for the salt; and the other, the maximum to which the combustion chamber may be heated. This gradient may vary from 150 deg. for light loads and long cycles to 500 deg. for heavy loads and short treating cycles. With this type of control mechanism, the heat is turned up only when the pyrometer shows that both control points call for heat, and it is turned down when either control point reaches the temperature for which it is set on the control instrument.

In closing the author wishes to thank the many persons who have aided in supplying material for this paper and in particular the aid of Dr. Donald A. Holt, R. & H. Chemicals Department, E. I. du Pont de Nemours & Co.; Mr. E. L. Bartholomew, United Shoe Machinery Corp., and Dr. Haig Solakian, the A. F. Holden Co.

[3] Transactions A.S.M., Vol. XXVII, No. 4, December, 1939.
[4] Ibid.

The Place of

Plywood, Plastics and Corrosion Resistant Steel in Aircraft Construction

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Johns Hopkins University
and
Consulting Design Engineer,
Glenn L. Martin Co.

o o o

DETAILED data on plywood and plastics, and the role of these materials in aircraft manufacture were presented in the first part of this article last week. The following paragraphs deal with the present and future of corrosion resistant steels in airframe construction.

STAINLESS STEEL: This in itself is a misnomer and has caused more difficulties to the introduction of the material into aircraft use than any other one item. It is best to call the material by its real name —corrosion resistant steel.*

Unfortunately, stainless steel was over-sold in the beginning and received a set-back that has taken many years to overcome. Only now have the different steel companies finally seen the light and have decided to give up their intercompany fights and concentrate on selling a standard product to industry in such form that it can be considered as a possible material for use in the aircraft field.

For many years there has been a type number for all C.R.S. steels meeting the same specification. The different companies have insisted in pushing trade names instead of type numbers so that the engineering and shop men and purchasing offices spoke in riddles to each other if they were trained under different companies and the services did not help matters at all, since they have avoided the use of the standard type number in the material specification.

Even today, one of the most difficult and least understood materials is C.R.S. steel in its many forms. Most people talk about 18-8 (18 per cent chromium and 8 per cent nickel) as though that one material covered the field. This is not so, and as many different combinations and modifications are to be found in C.R.S. as in any other steel or aluminum alloy.

It is felt that this article may serve a useful purpose if it does nothing else than supply a table of C.R.S. type numbers and the uses to which these steels may be employed—linked up with the service specifications that apply to the type under consideration, as shown in Table III. For detail processes, reference should be made to the "Fabrication of Stainless Steel" by the United States Steel Corp.

The data in Table III cover a number of the points that must be borne in mind when designing for C.R.S., and a brief explanation of the notes with certain addenda will

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STAINLESS steel gasoline tanks made by E. G. Budd Mfg. Co.

o o o

*A detailed article on application of corrosion resistant steel to aircraft manufacture appeared in THE IRON AGE, Jan. 30, 1941.—Ed.

TABLE II

Properties of Various Types of Plastics

(Maximum and Minimum Figures Submitted by a Number of Manufacturers of Each Type of Plastic Material)

PROPERTIES	PHENOL-FORMALDEHYDE COMPOUNDS				UREA-FORMALDEHYDE COMPOUND	METHYL METHACRYLATE RESIN		CELLULOSE COMPOUNDS	
	Molding	Laminated		Cast				Cellulose Acetate	
	Macerated Fabric Filler	Paper Base	Fabric Base	No Filler	Alpha Cellulose Filler	Cast	Molding	Sheet	Cellulose Acetate Butyrate
Molding qualities	Good to fair				Excellent	Good	Excellent	Excellent	Excellent
Compression molding temperature deg. F.	270-330	275-350	275-350		290-325		300-370	210-320	270-330
Compression molding pressure, lb. per sq. in.	3,000-8,000	1,000-3,000	1,000-3,000		1,500-6,000		1,000-3,000	500-5,000	1,500-5,000
Injection molding temperature deg. F.							390-500		310-390
Injection molding pressure, lb. per sq. in.							10,000-30,000		8,000-30,000
Compression ratio	2.5-11.0	1.5-3.0	1.5-3.0		3		1.5-2.0		2.0-2.3
Mold shrinkage, in. per in.	0.003-0.007				0.006-0.011		Compression 0.001-0.005 Injection 0.001-0.006	Positive and injection 0.002-0.003 Semipositive 0.005-0.007 Flash; 0.008-0.009	
Specific gravity	1.37-1.40	1.30-1.40	1.30-1.40	1.27-1.32	1.45-1.50	1.185	1.18-1.19	1.27-1.37	1.20-1.22
Specific volume, cu. in. per lb.	20.2-19.8	21.3-19.1	21.3-19.1	21.8-20.0	19.1-18.5	23.4	23.1-23.2	21.8-20.2	22.8-23.1
Refractive index, N_D				1.5-1.7	1.54-1.6	1.49	1.49	1.49-1.50	1.47-1.49
Tensile strength, lb. per sq. in.	6,500-8,000	7,000-18,000	8,000-15,000	5,000-12,000	9,000-12,000	7,000-9,000	4,000-6,000	6,000-11,000	3,700-6,800
Elongation, per cent						5-15	1-5	20-55	15-36
Modulus of elasticity lb. per sq. in. $\times 10^5$	7-12	4-20	3.5-15	5-15	12-15	4-6		1-3	
Compressive strength, lb. per sq. in.	20,000-32,000	20,000-40,000	20,000-44,000	1,500-30,000	24,000-35,000	11,000-13,000	10,000-15,000	4,000-16,000	11,300-20,300
Flexural strength, lb. per sq. in.	10,000-13,000	13,000-30,000	13,000-30,000		10,000-13,000	14,000	10,000-15,000		5,600-11,900
Impact strength, ft-lb. energy to break $\frac{1}{4} \times \frac{1}{2}$ in. bar C = Charpy, I = Izod	0.4-2.4 I	0.3-3.3 I	0.8-7.5 I	0.1-1.5 I	0.14-0.16 I	0.25-0.5 C	0.2-0.4 C	0.15-0.60 C	1.3-3.3 C
Hardness (2.5 mm. ball, 25 kg. load), Brinell No.		24-40	30-45	30-45	48-54 (500kg.,10mm)	18-20	18-20	6-11 (10 kg.)	9-11
Thermal conductivity, 10^{-4} cal. per sec. per sq. cm. per 1 deg. C. per cm.	3-5	5-8	5-8	3-5	7.1	1-10		5.4-8.7	7.7
Specific heat, cal. per deg. C. per gm.	0.30-0.35	0.3-0.4	0.3-0.4	0.3-0.4		0.4	0.4-0.5	0.3-0.4	0.35
Thermal expansion, 10^{-5} per deg. C.	2-6	1.7-2.5	1.7-3	2.8	2.5-3.0	8	8-9	14-16	13-15
Resistance to heat, deg. F. (continuous)	250-350	212-300	212-350	160	160	140-160	120-140	140-180	140-200
Softening point, deg. F.	None	None	None		None	150-230	150-230	140-230	140-250
Distortion under heat, deg. F.		>320	>320		260	155	125-160	122-212	136-200
Tendency to cold flow	None	None	None		None	Very slight	Slight	Slight	Slight
Water absorption, immersion—24 hr.	1.0-1.3	0.3-9.0	0.3-9.0	0.01-0.5	1-2	0.4	0.4-0.5	1.5-3.0	0.8-1.1
Burning rate	Approx. nil	Very low	Very low	Very low	Very low	Slow	Slow	Slow	Slow
Effect of age	None	Improves mechanical and electrical properties		Hardens slightly	Hardens slightly	Practically Nil	Practically Nil	Slight	Slight
Effect of sunlight	Light shades discolor	Lowers surface resistance		Colors may fade	None	Very slight	Very slight	Slight	Slight
Effect of organic solvents	None on bleed-proof materials			None	←	Soluble in ketones, esters and aromatic hydrocarbons		Soluble in ketones and esters; softened or slightly soluble in alcohol; little affected by hydrocarbons	
Effect on metal inserts	Inert	Inert	Inert	Inert	Inert	Inert	Inert	Inert	Inert
Machining qualities	Fair to good	Fair to excellent		Excellent	Fair	Excellent	Excellent	Good	Good
Clarity	Opaque	Opaque	Opaque	Transparent translucent opaque	Translucent opaque	Transparent (90-92% light transmission)		Transparent translucent opaque	Transparent translucent opaque
Navy specification	Type CF 17P4	Type PB 17P5	Type FB 17P5	None	None	None	P-41 Grade A	P-41 Grade B	None
Army specification	Type I-II 32212	Type I 71-484	Type II 71-484	None	None	None	94-12014	12025	None

TABLE III

Corrosion Resistance Steel Properties Chart

Alloy Name	18-8	18-8 Free Machining	18-88	18-8 Stabilized		18-8 Mo.	13 Chromium	13 Chromium Free Machining	17 Chromium
Type Number	Type 302 Sheet CRS1 Bar CRS1	Type 303	Type 304 Sheet CRS1 Bar CRS1A	Type 321	Type 347	Type 316	Type 410 Sheet CRS3 Bar CRS3	Type 416 Bar CRS6	Type 430 Bar CRS4
Typical Chemical Composition:									
Carbon	0.08 to 0.20		0.06 max.	0.10 max.	0.10 max.	0.10 max.	0.15 max.		0.12 max.
Manganese	1.25 max.		2.00 max.	2.00 max.	2.00 max.	2.00 max.	0.75 max.		0.75 max.
Phosphorus	0.03 max.	Same as 302	0.03 max.	0.03 max.	0.03 max.	0.03 max.	0.03 max.	Same as 410	0.03 max.
Sulphur	0.03 max.		0.03 max.	0.03 max.	0.03 max.	0.03 max.	0.03 max.		0.03 max.
Silicon	0.75 max.		0.75 max.	0.75 max.	0.75 max.	0.75 max.	0.75 max.		0.75 max.
Chromium	18 to 20	Plus Either	18 to 20	17 to 20	17 to 30	16 to 18	10 to 14	Plus either	14 to 18
Nickel	8 to 10		8 to 10	7 to 10	8 to 12	14 max.			
Titanium				4 XC min.					
Columbium									
Molybdenum		0.60 max or			10 XC	2.0 to 3.0 max.		0.60 max. or	
Selenium		0.07 min.						0.07 min.	
Physical Properties: (5)									
Density lb. per cu. in.	0.286	0.286	0.286	0.285	0.285	0.291	0.276	0.276	0.273
Spec. Elec. Res., Microhms per cu. in 68 deg. F	27.6 to 32.3	27.6 to 32.3	27.6 to 32.3	28	28	28.5	22.4	22.4	23.2
Melting Range deg. F.	2550 to 2590	2550 to 2590	2550 to 2590	2550 to 2590	2550 to 2590	2550 to 2590	2530 to 2570	2750 to 2790	2710 to 2750
Structure	Austenitic	Austenitic	Austenitic	Austenitic	Austenitic	Austenitic	Martensitic	Martensitic	Ferritic
Corrosion Resist. (9)	Rated "A"(11)	Rated "A"(11)	Rated "A"	Rated "A" for temp. (12) 800-1600 deg. F. (2)		Rated "A"	Rated "B" and "C"	Rated "B" and "C"	Rated "B" and "C"
Mechanical Properties:	Annealed or Cold Worked	Same as 302	Same as 302	Same as 302	Same as 302	Same as 302	Annealed Quench and Draw	Same as 410	Same as 302
Modulus of Elas., 10 lb. per sq. in.	29-26	29-26	29-26	29-26	29-26	29-26	28	28	29
Sealing Temp. Approx., deg. F.	1650	1650	1650	1650	1650	1650	1300	1300	1550
Initial Forging Temp., deg. F.	2200	2200	2200	2200	2200	2200	2100	2100	2000
Finish Temp., deg. F.	Not under 1600 to 1700	Same as 302	Same as 302	Same as 302	Same as 302	Same as 302	Not over 1450	Not over 1450	Not over 1400
Annealing Temp., F.	1900 to 2000 and Quench	Same as 302	Same as 302	Same as 302	Same as 302	1950 to 2050 and Quench	Furnace cool 1550 to 1100 or Air cool 1300 to 1400	Same as 410	Air cool 1500 to 1400
Magnetic Action (8)	Non to Para.	Non to Para.	Non	Non	Non	Non to Para.	Magnetic	Magnetic	Magnetic
SHEET									
Sheet—Navy	47-S-21		Gr. 1, 47S20	47S19	Same	——	Grade 3.47S20		
Sheet—Army	11068		——	57-136-9	as	——	——		
Drawing—Stamping (14)	Very Good		Good	Fair	321	Good	Good		
Spinning	(4)		——	——		——	——		
Weldability	Very good		Very good	Excellent		Very good	Fair—Not Recommended		
Ultimate Tensile (range) (5)	Anneal after 80,000 185,000 (1)		Anneal after 75,000 145,000	100,000 90,000	Annealed	Same as 302	70,000		
BAR									
Bar Rod—Forging (6) Navy	Grade 1 B&C 46-S-18	Grade 7 D&E 46-S-18	Grade 1A 46-S-18			——	Grade 3 46-S-18	Grade 6 45-S-18	Grade 4 46-S-18
Bar Rod—Forging (10) Army	Grade 1H 10079	10079 Allowed	Grade 1A 10079			——	—— (13)	——	——
Machineability (15)	Fair	Free Mach. (3)	Fair to Poor			Fair	Fair	Free Mach.	Fair
Weldability	Very good B only	Not Recom. except for D	Very good			Very good	Not Recom.	Not Recom.	No
Ultimate Tensile (range) (5)	95,000-B C&H-125,000	75,000-100,000	75,000			Same as 302	70,000 to 140,000	70,000	75,000
CASTING									
Casting—Navy		Grade 7 46-S-27	Grade 1 46-S-27					ASTM A-221-39 Class A	
Casting—Army		——	——					——	
Machineability		Free Mach.	Fair					Free Mach.	
Weldability		Fair—Not Recommended	Very good					Fair—Not Recommended	
Ultimate Tensile (range) (5)		70,000 min.	Anneal. over ¼ in. 70,000 min.					80,000 min. 110,000 max.	
TUBE									
Tubing—Navy (7)	44-T-27			44-T-25	Same as 321				
Tubing—Army (7)	Grade 1-S 57-180-3			Grade 1SS 57-180-3					
Bending	Fair to Poor			Excellent					
Weldability	No (Cold worked)			Excellent					
Ultimate Tensile (range) (5)	125-185,000			100,000					
WIRE									
Wire—Navy	Condition A 22-W-13	Condition H 22-W-13							
Wire—Army	Type I 48-37	Type II 48-37							
Use	Safety	Springs							
Magnetic	Non	Para.							
Ultimate Tensile (range) (5)	85,000 105,000	180,000 300,000							

Thomas H. Huff—1941

(1) Thin gages of sheet and strip:
Annealed—80,000 lb. per sq. in. Navy only*
¼ Hard—125,000 lb. per sq. in. A & N
½ Hard—150,000 lb. per sq. in. A & N
¾ Hard—175,000 lb. per sq. in. A & N
Full Hard—185,000 lb. per sq. in. A & N

(2) For maximum corrosion resistance in high temperature service, use following stress relieving operation—Heat for 2 hr. at 1550 deg. F., air cool.

(3) Non-seizing quality—Only one of a pair of mating parts need, for workability, be made from Grade 7 (303 Type). The other may be of Grade 1 (302 Type) material.

(4) Annealed stock of 302 Type must be used for drop hammer, hydro press or spinning operations. Types 321 and 347 are not substitutes due to poorer forming characteristics. Only annealed stock to be torch or arc welded unless local physical strength reduction is permissible.

(5) Physical characteristics—Ultimate, yield, elongation, Brinell, etc.—see Detail Specifications in bar and forged stock. Strength varies with size.

(6) For swaged cable ends, Navy Spec. S-127, special type, min. ultimate—90,000 lb. per sq. in.

(7) Tubing (welded):
Navy 44-T-26—Use Type 321 or 347
Army 57-180-4—Annealed 90,000 lb. per sq. in.

(8) The non-magnetic quality of CRS steel varies with the cold working. In general, the annealed is non-magnetic and the hard para-magnetic. Most bar and swaged stock is magnetic.

(9) Surface finish affects the corrosion resistance and must be specified. No. 2 finish—pickled, annealed and passivated should be used for stock to be formed or machined. No. 4 finish is standard for ¼ H. and up but No. 2 is often good enough and more economical if parts are to be worked and later polished.

(10) Navy 46-S-18, Grade 2 and 5 not included. See specifiaction for details.

(11) Type 302 and 303 not to be used where working temperature exceeds 800 deg. F. as in exhaust stacks, etc.

(12) Type 309 &309S—25 Chrome, 12 Nickel is to be used on the high-powered engines for exhaust stacks and other items where temperatures are excessive. 309 is stabile up to 1600 deg. F. and 309S up to 2100 deg. F. No Government specification for this material.

(13) Army Specification 10080 is a 12 Chrome, 2 Nickel alloy for forgings. This material is not recommended. It has no standard type number.

(14) Type 301 (17-7) is similar to 302 but preferred for roll-draw operations by some of the larger fabricators. There are no Army and Navy specifications except that 301 can be purchased under 302 specification if so stated in the order.

(15) Machineability:
18-8 Approx. 30 per cent
18-8 F. M. Approx. 50 per cent

point out more clearly why the problems are important.

The 18-8 C.R.S. series are austenitic steel and cannot be heat treated to increase their physical characteristics. The only method then available is to work-harden this material by rolling or drawing. The normal conditions of temper are therefore annealed ¼, ½, ¾, hard and full hard. These conditions all affect the elongation, ultimate yield and fatigue values, as well as the Brinell and Rockwell measurement.

The various tempers therefore affect the method of handling this material in the shop and processes through which it can be formed, forged or machined. This is particularly important in aircraft, where the number of parts is relatively small and the tool cost must be kept within reasonable limits. These factors have not always been thoroughly understood and the industry finds several discrepancies in the service specifications on this account, in order to handle 302 material.

Again refer to Table I—many more uses for C.R.S. in the Defense Program are found. In fact, these total more than 40 per cent of the airframe cost and could even be expanded beyond this point, based upon service test life and experiences. This is, however, limited by inexperienced engineering and shop personnel and takes into consideration the tremendous expansion that is required to undertake a new form of construction.

It must not be considered that the above 40 per cent in any way could be included in any one production article for the Defense Program, for these have just the same limitation that is met in the use of the older form—plywood. It is possible to expand just so fast and this is a goal to aim for, but one that cannot be reached except in a few isolated cases.

C.R.S. for airframe work has been pioneered by the Edward G. Budd Co., Philadelphia, and Fleetwings, Inc., Bristol, Pa. This development has gone hand in hand with spot welding of C.R.S. and except for spot welding, the use of C.R.S. would be extremely limited as is the case of the riveted chromium iron construction carried on in England before the war, but not a real factor in the present emergency building program.

It is interesting here to note that England was many years ahead of this country in the development of thin sheet steel airframe construction, and that the English have left behind them this work and concentrated on aluminum alloy.

The same could be said of plastics and plywood. Two or three years ago it was customary to advise anyone interested in giving these materials a thorough investigation, to have them first study what was being done in England before going too far in the new field. These have all been left behind with the advent of the war and it is felt that industry in this country must make a real effort to undertake these processes and materials in order to be able to utilize facilities toward the one end—an efficient and broad Defense Program production.

TABLE IV

Solution Potentials Measured in Sodium Chloride Solution

(Aluminum Co. of America)

Metal or Alloy	Potential in Volts* Measured in a 1 Normal (5.85 per cent) Sodium Chloride Solution Containing 0.3 per cent Hydrogen Peroxide (N/10 Calomel Scale)
Magnesium	—1.73
AM3S	—1.71
AM57S	—1.68
AM240-T4	—1.66
Zinc	—1.00
No. 220-T4	—0.96
72S-O	—0.96
No. 214	—0.87
56S-O	—0.87
Pure aluminum (7A)	—0.85
52S-O	—0.85
2S-O	—0.83
2S-H	—0.83
3S-O	—0.83
3S-H	—0.83
53S-W	—0.83
53S-T	—0.83
61S-T	—0.83
No. 43	—0.83
Cadmium	—0.82
No. 365-T4	—0.81
No. 355-T4	—0.78
No. 195-T4	—0.70
17S-T	—0.68
24S-T	—0.68
Mild Steel	—0.67
Lead	—0.55
Tin	—0.49
Brass (60-40)	—0.28
Copper	—0.20
Stainless steel (18-8)	—0.15
Monel metal	—0.10
Silver	—0.08
Nickel	—0.07
Inconel	—0.04

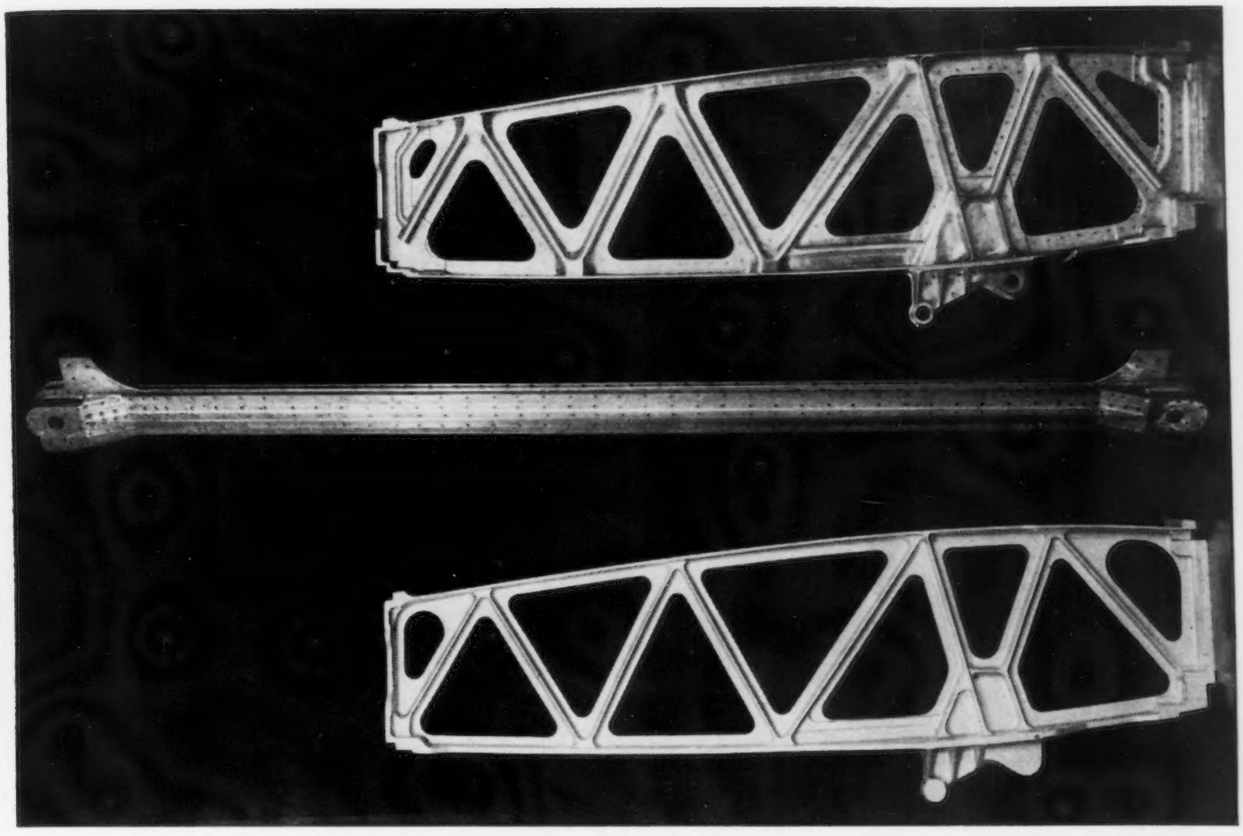
* These values vary somewhat depending on the particular lot of material investigated and on the surface preparation employed.

The use of C.R.S. in aircraft must be considered very carefully since the material is three times the weight of the aluminum alloy that it is to replace, and unless usable in the cold worked condition, is not in turn three times as strong. In many cases minimum gages in aluminum alloy parts are set to permit handling the structure and present a smooth surface free from "music" or "oil canning." To replace arbitrarily these light alloys with a corresponding weight in strong alloys (C.R.S.) would result in a worthless structure from the airframe service point of view. Therefore, it is mandatory that the part be entirely redesigned and restressed in order that a satisfactory replacement part can be manufactured. This requires engineering and manufacturing skills that are not available in any large number, and as a consequence it is necessary to move very slowly else the result will again be detrimental to the material in question.

The design problem should not be viewed as a battle between the two materials, but rather, as a challenge to conquer new engineering and manufacturing problems for the betterment of the Defense Program.

As stated before, it is expected that the entire production recommendations could not be incorporated in any one of the Defense Program airplanes, but rather, that selected items should be redesigned in order to utilize additional fabricating facilities. The principal problem in this addition is an engineering one. Corrosion resistant alloy cannot be substituted directly for aluminum alloy. In fact, the problem of engineering corrosion resistant materials is one that has been gradually introduced during the past 10 to 12 years, principally outside the aircraft industry, where production volume has been sufficient to warrant the tooling and equipment required for the suitable fabrication of this strong alloy.

It is believed that no one should attempt to apply corrosion resistant alloy without being fully conversant with the problems involved in its fabrication. The desire is, of course, to avoid the impractical applications that would hinder rather than help the immediate



STAINLESS steel ribs and spars. Courtesy E. G. Budd Mfg. Co. and Glenn L. Martin Co.

program. There is, of course, a large increase in demand for corrosion resistant alloy in all industries and it would be foolish to jeopardize these others by the improper application of corrosion resistant alloy where production facilities are lacking.

Experience to date in the aircraft field definitely indicates applications in certain major categories where the replacement of aluminum alloys would best fit in the development of production schedules. The outstanding instances are in the power plant group, where it is practically universal to use a strong alloy material for exhaust stacks, firewalls, ducts, etc., and it has been indicated that a definite advantage could be obtained by the further use of corrosion resistant alloys in the construction of certain of the nacelle parts, namely, the nacelle structure *per se* and the venturi or accessory cowls. The heat resistant qualities of corrosion resistant alloy offer a definite advantage around the engine compartments that, in the case of fire, would be subjected to temperatures in excess of 400 deg. F.

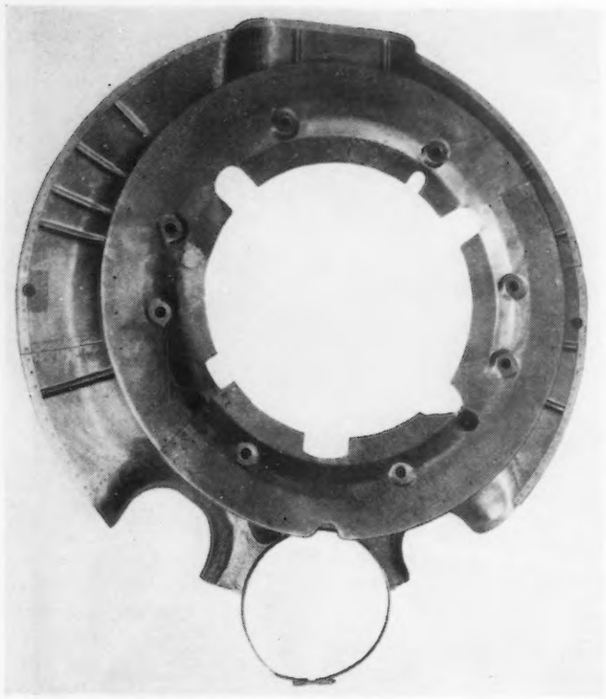
A second important use in the present production program would be in the fabrication of all movable control surfaces; namely, the elevators, rudders and ailerons. It is customary to cover these surfaces with fabric, and experience has indicated the practicability of corrosion resistant steel for use in small drawn-rolled sections fabricated by spot welding as a satisfactory means of constructing these surfaces. There has been sufficient service of this type constructed in the past so that a relatively short time will be required to institute a change of this nature.

A further application that would require more thorough investigation would be the utilization of corrosion resistant alloys in the wing spars. These spars would be used with the conventional aluminum alloy ribs and aluminum alloy covering. There are several possibilities of improvement in design by utilizing these strong alloys. Certain detail parts such as nose ribs, wing tips, and possibly flaps have a definite application in corrosion resistant design and, while there are certain problems in the utilization of dissimilar metals that may militate against this development, it is certainly worth giving consideration.

The manufacture of fuel tanks from corrosion resistant steel, while technically under the power plant category, should be considered of primary importance. While a majority of the main fuel tanks are of bullet-proof construction, there are sufficient auxiliary bomb-bay tanks, etc., required in present-day craft to warrant the utilization of this material, relieving to a great degree the aluminum alloy load.

Under miscellaneous small parts, such as forgings, castings, etc., it is possible to develop stampings in corrosion resistant steel that can be fabricated by spotwelding to replace a number of these parts and constitute a definite saving in both cost and weight.

It is possible to secure many more sources of supply for these small parts, since the engineering required for this type of conversion is much more readily obtained from the outside than in the more



A C.R.S. engine deflector.

detailed aircraft units, and it is believed that a considerable number of plants would be available for assistance in this substitution particularly in the development under the auspices of the automotive industry, which has been familiar with the sources of supply for automotive parts.

There is an additional point that must be kept in mind with the introduction of C.R.S. into the airplane. That is the use of dissimilar metals and the electrolytic effect due to the difference of potentials between the aluminum alloys and the C.R.S. This factor must be given careful consideration even with the common steels and even more carefully handled with C.R.S. due to the greater potential differences. Table IV indicates the relative position of these various materials and should be referred to when considering any composite structure.

The detrimental effect of the combinations between C.R.S. and aluminum is always to corrode the aluminum alloy and care must be exercised to provide adequate protection by some form of inhibitor.

The problem of the introduction of plywood plastics and corrosion resistant steel into the aircraft industry is, of course, complicated by the present rush of defense production. This very point, however, is the best entering wedge that could be offered such forms of construction due to the tremendous demand on the aluminum industry.

Due to this present demand and the resultant delivery schedules, it is now possible for the proponents of the competitive material to enter the field if they exercise the necessary sales ingenuity to take advantage of the present situation. They must realize that if they are able to break into the field in any major degree that after the rush is over, they will have obtained a definite foothold and have an even chance of retaining their position and even expand this position providing the service results warrant such expansion.

To undertake such a development will require the cooperation of both the seller and the buyer. It is believed that the airframe industry is receptive and it is then only dependent upon the skill of the vendor in presenting his wares. He must realize that the airframe manufacturers are extremely busy and he must, therefore, make things as simple as possible to secure their attention, and not expect them to undertake a large amount of redesign in the initial stage.

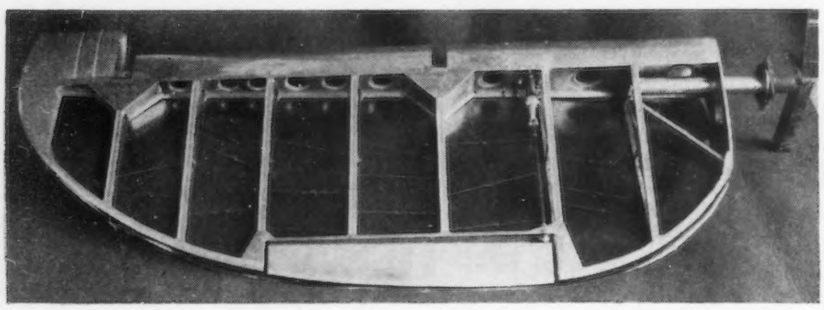
The vendor must be equipped with experienced aircraft personnel that are in a position to advise, first the vendor on proper application, second, the airframe manufacturer on the limitation and advantages of this material and design involved, and third, and most important, advise the probable subcontractor on the detail designs to conform most satisfactorily with the equipment available in the parts plant.

Without this combination, the results are apt to be worthless, except in the case of the few experienced parts manufacturers that have been in the field for many years.

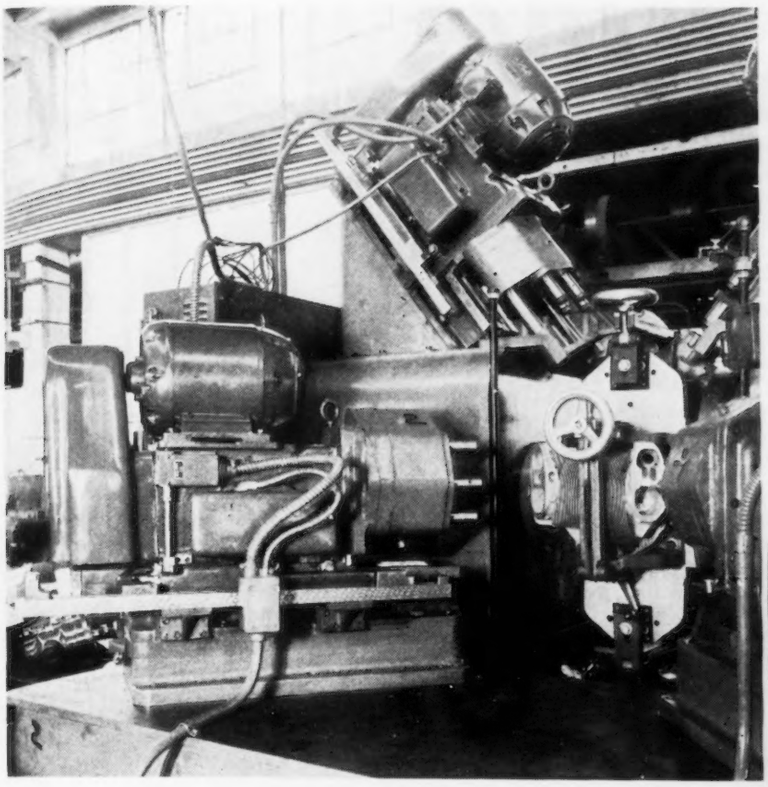
In the majority of instances, the small, apparently unimportant details such as attachment of composite structures for final assembly, the effect of dissimilar metals or corrosion and such, are the most difficult to foresee and can be beaten at the outset only with sound aircraft manufacturing experience.

There are many companies that are available for use as sub-contracting plants that are willing to undertake this work only provided they are supplied with the finished production drawing. It is necessary for some intermediate group, therefore, to take up the slack between the airframe manufacturer and the parts plant and this should logically be the material source of supply.

Unless this effort is made, there will be no real progress made in the introduction of these new materials.



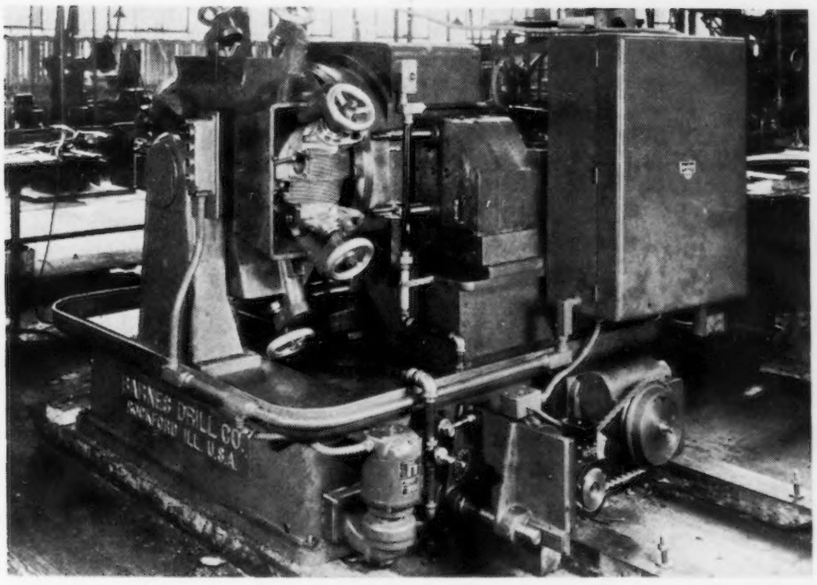
A STAINLESS steel elevator made by the E. G. Budd Mfg. Co.



AIRCRAFT engine production reached the final stage of mass production methods when last year builders adopted fully special purpose way drilling machines heretofore seen only in the automotive industry. This group of photographs show several such machines built by Barnes Drill Co. for a number of related operations on aluminum cylinder heads for radial aircraft engines.

ABOVE

SPECIAL four-station hand indexing machine for drilling, countersinking and tapping manifold holes in aircraft cylinder heads. This is a rear view of the machine, showing angular and horizontal drilling units, each carrying a four-spindle, fixed center auxiliary head. Cylinder heads rest on four hardened pads and are located by crank operated pins engaging valve tappet holes. Clamping is by leaf clamps and pivoted screws and handwheels.



ABOVE

SPECIAL six-station center column indexing machine for performing the following operations on aluminum cylinder heads: 1st station, load; 2nd station, end mill through cast fins; 3rd station, drill spark plug holes; 4th station, ream same holes; 5th station, countersink, and 6th station, tap. Machine has five units mounted vertically and five units mounted on an inclined angle. Work holding fixtures are arranged with crank operated locating pins for positioning castings accurately. Production is 100 pieces per hr. Drilling and reaming units have positive screw feed.

AT LEFT

ANOTHER special purpose, four-station hand indexing machine for drilling, countersinking and tapping cowl mounting holes in aircraft cylinder heads. Machine consists of one four-spindle sliding head mounted on dovetail slide for drilling; one similar head for countersinking and one four-spindle head with individual lead screw for tapping. Fourth station, on top, is for loading.

41 Lessons in

LESSON No. 34: *Object is to make a ¼-in. fillet weld in the vertical position.* Apparatus used is Westinghouse Flex Arc welding machine, chisel, hammer and wire scratch brush. Material used is two 6x8x¼ in. steel plates, and 5/32-in. diameter Crucible Weld "AP" welding electrodes.

INSTRUCTIONS: The production of a fillet weld in the vertical position is very similar to the production of a 90 deg. single vee butt weld as discussed in Lessons 32 and 33. Consequently, the same weaving procedures will apply. The major difference between the two types of welds lies in the fact that the root of the weld is deposited on heavy sections rather than on thin beveled edges. This makes it somewhat easier to obtain complete penetration at the root without danger of burning through the plates.

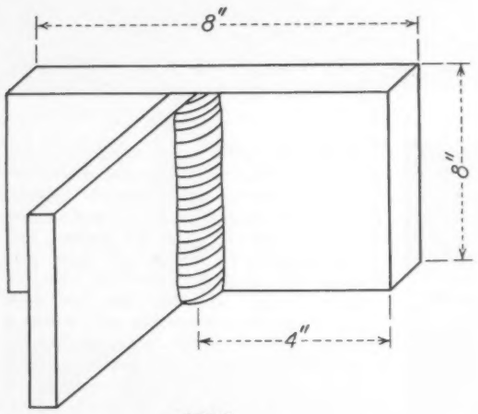
A single downward pass will not make a ¼-in. fillet weld, consequently it is recommended that the upward procedure be used. Either of the weaves shown in Fig. 55 will be found satisfactory and the choice will depend largely upon the skill of the operator. In most cases the procedure shown in Fig. 55-b is preferred because the long upward whipping motion of the electrode prevents the metal from becoming overheated and running away.

PROCEDURE: Set the polarity reversing switch on reverse polarity, adjust the welding current to about 125 amp. and tack weld two ¼-in. plates together, as shown in Fig. 58. Mount the tack welded plates in the vertical position and securely ground them to the welding table.

Weld the plates together by using either of the two weaves illustrated in Fig. 55. Be sure to hold a short arc. Try to make the weld uniform in appearance and to obtain complete penetration.

After the weld is completed, have the instructor inspect it for appearance and then fracture it. The fracture should be sound and show complete penetration.

Repeat this exercise until a sound weld of satisfactory appearance can be made.



ABOVE

FIG. 59—Procedure to follow to make a ⅜-in. fillet weld in the vertical position.

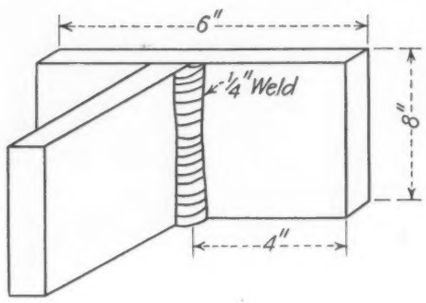
o o o

RIGHT

FIG. 58—Method of making a ¼-in. fillet weld in the vertical position.

LESSON No. 35: *Object is to make a ⅜-in. fillet weld in the vertical position.* Apparatus used is Westinghouse Flex Arc welding machine, chisel, hammer and wire scratch brush. Material used is two 6 x 8 x ⅜ in. steel plates, and 5/32-in. diameter Crucible Weld "AP" welding electrodes.

INSTRUCTIONS: A ⅜-in. vertical fillet weld can be made in two passes. The first pass can be made by welding either upward or downward but the second pass should be made by welding upward. Downward welding is generally preferred for the first pass because it seals the crack between the plates and eliminates a great deal of trouble from arc blow.



The deposition of the second pass is made by using a triangular weave of the type illustrated in Fig. 55-a. The thickness of the second layer, and consequently the final size of the weld can be controlled by the rate of weave. A rapid weave and advance will make a smaller weld than a slower weave and advance.

A short arc should be maintained and special care taken to prevent undercut at the weld edges.

PROCEDURE: Set the polarity reversing switch on reverse polarity, adjust the welding current to about 140 amp. and tack weld two ⅜-in. plates together as shown in Fig. 59. Mount the tack welded plates in the vertical position and securely ground them to the welding table.

Weld the plates together by depositing the first pass downward with 5/32-in. diameter electrodes and the second pass upward with 3/16-in. diameter electrodes. Carefully clean the first pass before depositing the second. Hold a short arc. Adjust the weave and rate of advance on the second pass so that a weld of the proper size will be made.

After the weld is completed, have the instructor inspect it for appearance and then fracture it. The fractured weld should show complete penetration and deposited metal free from flaws.

Repeat this exercise until a sound weld of satisfactory appearance and size can be made.

LESSON No. 36: *Object is to make horizontal butt weld between two vertical plates.* Apparatus used is Westinghouse Flex Arc welding machine, chisel, hammer and wire scratch brush. Material used is two 3x6x⅜ in. steel plates, with a 45 deg. bevel on one end of each, and ⅛-in. diameter Crucible Weld "AP" welding electrodes.

ARC WELDING

—Continuation of a series of lessons to enable beginners to master the fundamentals of bare and shielded-arc welding techniques.

INSTRUCTIONS: The horizontal butt type joint is commonly used on pipe or tank work when the parts are in the vertical position and cannot be rotated to facilitate downhand welding. This type of joint is made by depositing a series of string beads. Weaving is not recommended because of the excessive roll obtained.

Many types of joint designs are used for horizontal butt welds. The bottom plate may be beveled or cut in right angles to the plate surface. The top plate should always be beveled and the angle of bevel will depend largely upon the bevel of the bottom plate. In no case should the included angle be less than 45 deg.

In order to fuse the kerf surface of the top plate overhead welding must be approximated, consequently the greater the angle of bevel on this plate, the easier it will be to obtain good fusion. A short arc should be held at all times and care taken to prevent the beads from rolling and entrapping slag.

PROCEDURE: Set the polarity reversing switch on reverse polarity, adjust the welding current to about 150 amp. and tack two ⅜-in. plates together to form a 90 deg. single vee butt weld. Mount the tack welded plates in the vertical position so that the joint is horizontal and securely ground them to the welding table.

Weld the plates together by using a series of string beads, as shown in Fig. 60. Be careful to locate the beads so that too narrow a groove is not obtained between bead 2 and the plate so that incomplete fusion cannot be obtained with bead 3. Be sure to hold a short arc. Try to improve the appearance as the weld progresses.

After the weld is completed, have the instructor inspect it for surface appearance, roll and undercut. Following the instructor's inspection, nick the weld and fracture the joint. The exposed fracture should show sound metal free from gas pockets, slag inclusions, poor fusion and incomplete penetration.

LESSON No. 37: *Object is to deposit beads in the overhead position by using flux coated position type electrodes.* Apparatus used is Westinghouse Flex Arc welding machine, chisel, hammer and wire scratch brush. Material used is steel plate ¼ in. or heavier, and 5/32-in. diameter Crucible Weld "AP" welding electrodes.

INSTRUCTIONS: Welding in the overhead position with coated electrodes is done in the same manner as that outlined in Lesson 19 for bare type electrodes. Special care must be taken, however, to properly control the slag deposited by the electrode to prevent it from becoming entrapped in the weld.

Holding a short arc is essential in order to obtain the proper metal transfer from the electrode to the work. The electrode should be pointed at right-angles to the plate or toward the weld at an angle of about 15 deg., as shown in Fig. 61.

Most overhead welding is made in string beads although a slight weaving motion can sometimes be used. Excessive weaving should not be practised because it tends to create a large pool of metal which is difficult to control in the overhead position.

PROCEDURE: Set the polarity reversing switch on reverse polarity and adjust the welding current to about 100 amp. Tack weld a plate in the overhead position so that welding can be done on the underneath side.

(1) Practice striking the arc overhead until it can be easily struck and maintained.

(2) After the art of striking the arc has been mastered, deposit short string beads by holding a short arc. Inspect the beads for smoothness, undercut, etc.

(3) Repeat exercise (2) by holding a medium and long arc. Note

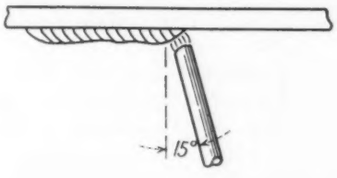
RIGHT

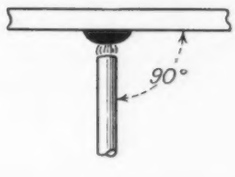
FIG. 60—Procedure to follow to make a horizontal butt weld between two vertical plates.

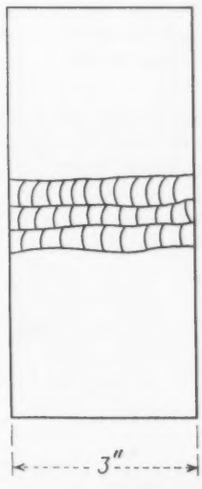
° ° °

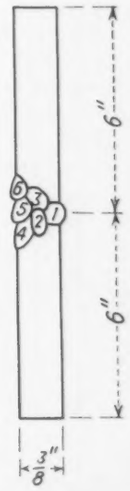
BELOW

FIG. 61—Method of pointing electrode to deposit overhead beads.









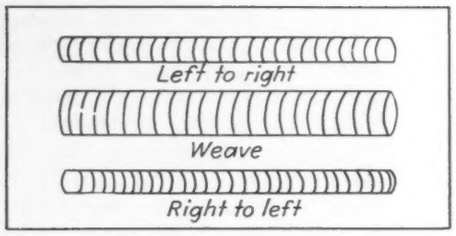


FIG. 62 — Test piece used to study the deposition of beads in the overhead position by using flux coated position type electrodes.

the difficulties obtained and the appearance of the beads.

(4) Deposit a bead by weaving about ¼ in., using a crescent-shaped weaving motion.

(5) After it is possible to make a uniform bead in the overhead position, make a test piece as shown in Fig. 62.

LESSON No. 38: *Object is to make a butt weld in the overhead position with flux coated position type electrodes.* Apparatus used is Westinghouse Flex Arc welding machine, chisel, hammer and wire scratch brush. Material used is two 3 x 6 x ⅜ in. steel plates with a 45-deg. bevel on one end of each, and ⅛-in. diameter Crucible Weld "AP" welding electrodes.

INSTRUCTIONS: The deposition of a butt weld in the overhead position should be made by depositing a series of string beads. In some cases a slight weave may be used but this procedure is not recommended for the beginner. A short arc should be maintained at all times in order to obtain proper metal transfer. Remove all slag before depositing succeeding layers and chip out all bad spots to insure complete fusion and freedom from entrapped slag.

The most difficult task in making an overhead butt weld is in obtaining complete fusion with the first pass without burning holes in the thin edges of the plates at the root of the weld. Periodically, lengthening the arc or whipping the electrode along the joint when the metal appears to become too hot will greatly aid in preventing the burning of holes.

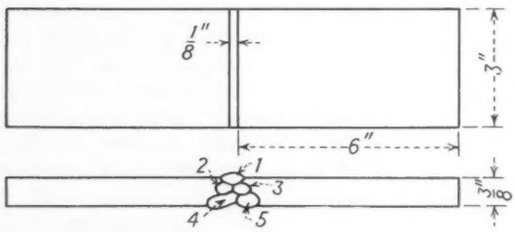


FIG. 63—Method of making a butt weld in the overhead position with flux coated position type electrodes.

PROCEDURE: Set the polarity reversing switch on reverse polarity and adjust the welding current to about 100 amp. Tack weld two ⅜-in. plates together to form a 90-deg. single vee butt joint and mount them in the horizontal position so that they can be welded in the overhead position.

Weld the plates together by using five passes, as shown in Fig. 63. Hold a short arc and take special care to make uniform beads free from undercut. Clean each bead before depositing the next bead. Chip all welds that are not smooth.

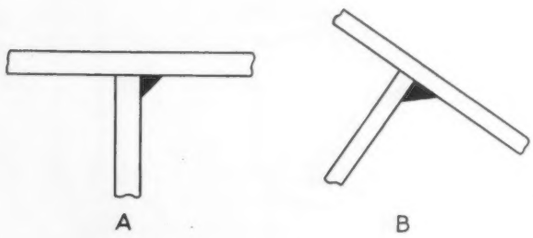


FIG. 64 — Overhead fillet welds may be made in these two positions.

After the welded joint is completed, have the instructor inspect it. Following the instructor's inspection, nick the weld and break it. Repeat this exercise until a weld free from gas pockets, slag inclusions, poor fusion and incomplete penetration can be obtained.

LESSON No. 39: *Object is to make a fillet weld in the overhead position with flux coated position type electrodes.* Apparatus used is Westinghouse Flex Arc welding machine, chisel, hammer and wire scratch brush. Material used is two 6 x 8 x ⅜ in. steel plates and ⅛-in. diameter Crucible Weld "AP" welding electrodes.

INSTRUCTIONS: Overhead - fillet welds may be made in two positions, as illustrated in Fig. 64.

A fillet weld made with the two plates positioned at an angle as shown in Fig. 64-B is similar to a butt weld and should be made as such. Also fillet welds on lap and tee joints are made in the same manner, consequently only the tee welded joint will be considered in this lesson.

Overhead fillet welds are generally made in a series of string beads similar to the method discussed for overhead butt welds. Because of the heavy plate sections at the root of the weld, however, there is no danger of burning holes in the parts.

PROCEDURE: Set the polarity reversing switch on reverse polarity and adjust the welding current to approximately 100 amp. Tack weld two ⅜-in. plates together to form a 90-deg. tee joint, as shown in Fig. 65. Mount the plates as shown in Fig. 65 so that a fillet weld can be made in the overhead position.

Use three beads to make the weld. Hold a short arc at all times and clean the weld between passes. Chip the deposits when necessary to insure sound fusion and freedom for slag inclusions.

After the instructor has inspected the finished weld for appearance, fracture the weld. The weld must show complete penetration and be free from gas holes, slag inclusions and poor fusion.

Repeat this lesson until a satisfactory weld can be made.

LESSON No. 40: *Object is to make a 5/16-in. horizontal fillet weld by using a flux coated fillet-position type electrode.* Appa-

ratus used is Westinghouse Flex Arc welding machine, chisel, hammer and wire scratch brush. Material used is two 6 x 8 x $\frac{3}{8}$ in. steel plates, and $\frac{1}{4}$-in. diameter Crucible Weld "FP" electrodes.

INSTRUCTIONS: In general construction work the major portion of all welds are fillet welds. As a result the crucible weld "FP" electrode has been developed which is particularly adapted for this class of work.

These electrodes are suitable for making both fillet and butt welds in all positions. The welding procedure employed, however, is similar to that employed with other flux coated electrodes, consequently only a few typical joints will be studied.

This electrode produces somewhat less penetration than the crucible weld "DH" and "AP" electrodes, consequently it is especially adapted for thin sheets and joints which contain a poor fit-up. In many cases it is possible to use an electrode of larger diameter than was possible with other types of electrodes. This, of course, means higher welding speeds. Horizontal fillet welds as large as 5/16 in. can easily be made in a single pass without weaving the electrode. In order to make larger welds a slight weaving motion is sometimes used, but it will generally be found that the best practice is to deposit a series of string beads.

The electrode should be held at an angle of about 30 deg. with the horizontal plate and pointed back toward the weld. A short arc is recommended. Either straight or reverse polarity may be used although straight polarity is recommended.

PROCEDURE: Set the polarity reversing switch on straight polarity and adjust the welding current to about 275 amp. Tack weld the $\frac{3}{8}$-in. plates together, as shown in Fig. 66, and securely ground them to the welding table.

Weld the passes together with a 5/16-in. fillet weld by using a single pass with the electrode. Hold a short arc and try to prevent undercutting. Note the typical reinforced weld that is produced.

After the weld is completed, fracture it and examine the fracture for soundness and complete fusion.

Repeat until a satisfactory weld free from undercut can be obtained.

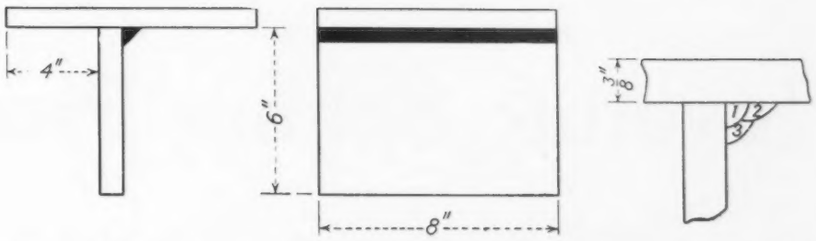


FIG. 65—Procedure for fillet weld in the overhead position with flux coated position type electrodes.

LESSON No. 41: *Object is to make a ½-in. horizontal fillet weld by using a flux coated electrode of the fillet-position type.* Apparatus used is Westinghouse Flex Arc welding machine, chisel, hammer and wire scratch brush. Material used in this lesson is two 6 x 8 x ½ in., steel plates and ¼-in. diameter Crucible Weld "FP" electrodes.

INSTRUCTIONS: The production of a ½-in. horizontal fillet weld with FP type electrodes can be made with three beads by using a ¼-in. diameter electrode. The welding procedure employed is similar to that discussed for the crucible weld "AP" electrodes (Lesson 30).

PROCEDURE: Set the polarity reversing switch on straight polarity and adjust the welding current to about 275 amp. Tack weld two ½-in. plates together, as shown in Fig. 67, and securely ground them to the welding table.

Weld the plates together by using three passes, as shown in Fig. 67. Be sure to clean each bead before depositing the next one.

Have the instructor inspect the weld for appearance and undercut. After the instructor's inspection, fracture the weld and examine it for soundness and complete penetration.

Repeat this exercise until a satisfactory weld can be made.

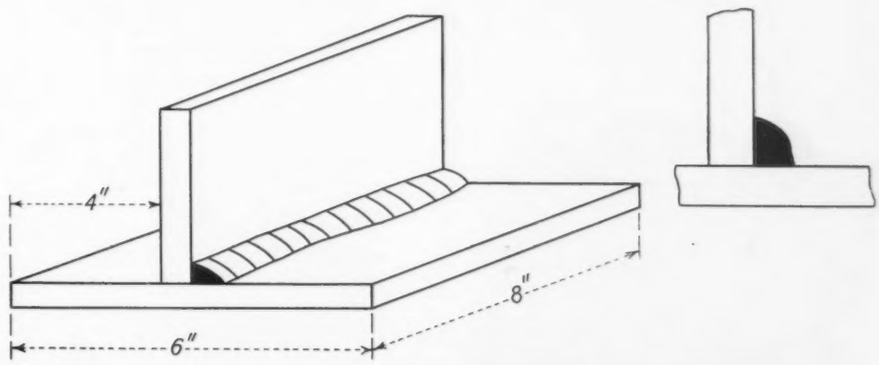


FIG. 66—Method of making a 5/16-in. horizontal fillet weld by using a flux coated fillet-position type electrode.

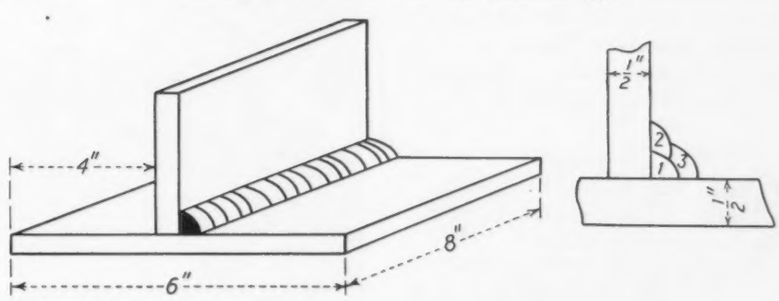


FIG. 67—Method of making a ½-in. horizontal fillet weld by using a flux coated electrode of the fillet-position type.

Involute Splines Produced with

AN innovation in the machining of sliding spline connections on automotive propeller shafts is now permitting the production of such splined parts in large scale production with no measurable backlash. Developed at the Detroit plant of the Universal Products Corp., the new sequence of operations on the stem of the universal joint yoke consists of rough hobbing a series of involute splines and then finishing them by an adaptation of the crossed-axis shaving process now widely used to finish gear tooth forms. According to Universal Products, the savings made on the hobbing process (by not attempting to hold the accuracy here) offsets the added expense of the shaving operation. Equivalent accuracy in the female member at the end of the propeller shaft is obtained by high precision broaching in three passes.

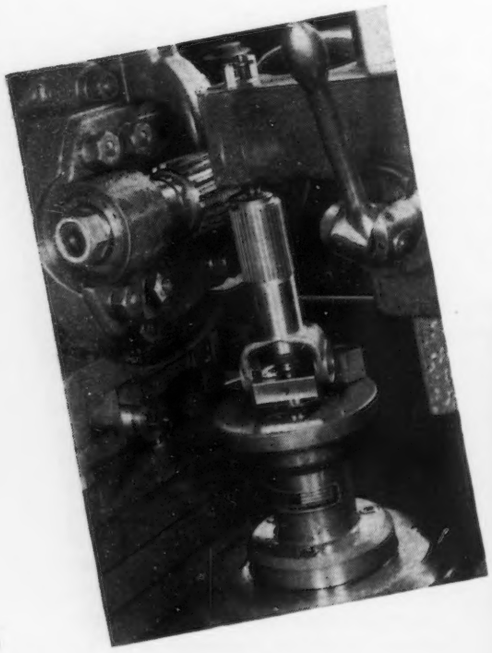
To permit the use of this type of equipment, the male splines in form are generated involute teeth. In addition to permitting the use of the crossed-axis gear shaving process, the tooth design provides a stronger assembly, since the increased width at the root of the teeth increases resistance to shear and the increased contact area increases the life of the splines. From 26 to 38 splines are used on the three standard sizes of shafts produced, giving the appearance of a series of serrations around the stub end of the universal joint stem. Diameter of the latter is around 2 in.

Prior to the shaving operation, the stub ends are semi-finish hobbed in Cleveland single-spindle and eight-spindle rotary machines. Each shaving machine takes care of the output from four or more single-spindle hobbing machines. Mitco three-thread hobs are used. Due to the use of shaving equipment for finishing, Class B hobs can be utilized. The involute shape of spline formed is roughly indicated by specifications for the hob which, for the 38 spline stub end, is 21.111 diametral pitch, 20 deg. pressure angle, 2 deg. 14 min. thread angle and lead 0.192 in. Feed is 0.10 in. per revolution of the work. Length of splined end is approximately 3 in.

To provide maximum accuracy of tooth profile, rack type gear shaving equipment is used. The machines, made by Michigan Tool Co., are the series 900 type in which the work is mounted between live centers. A generating rack is reciprocated in mesh with the rough hobbed teeth while the head of the machine, carrying the work, is fed downward. With this type of equipment, accuracy of tooth profile is almost entirely dependent on the accuracy of the serrated blades of the cutting rack.

A production rate of some 70 to 80 pieces per hour is obtained in spite of the high accuracy required. The rack itself has approximately 100 teeth, giving from three to four revolutions of the part for each stroke of the rack. In practice, some 12 to 16 strokes of the shaving rack are used to finish the splines. Two Michigan machines are used to take care of production requirements on all sizes.

Incidentally the splines are so designed that the same rack can be used for finishing all three sizes of yokes, all splines having the same pitch and pressure angle. The



ABOVE

SPLINES are semi-finish hobbed on Cleveland single-spindle machines. Eight-spindle rotary hobbing machines are also used for this operation. Due to the use of shaving equipment for finishing, Class B hobs can be used.

RIGHT

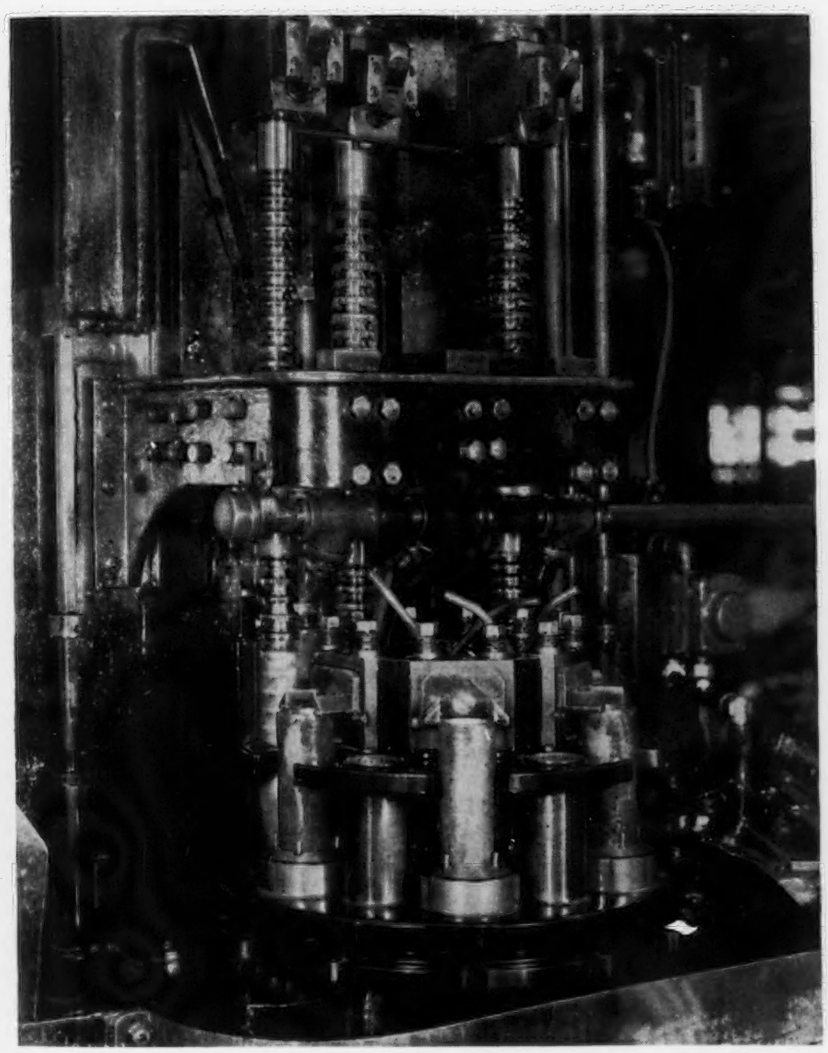
SERIES 900 Michigan rack type gear shaving machines finish the fine involute splines on universal joint yoke stems. Production is 70 to 80 pieces per hr.

Zero Backlash

ACCURACIES to within 0.0001 to 0.0002 in. are being obtained on involute splines for universal joints. This photograph shows the end piece of the propeller shaft (which later will be welded to the tube) assembled over the involute splines on the yoke stem.

rack differs from conventional gear shaving racks mainly in the larger number of blades required for the fine pitch.

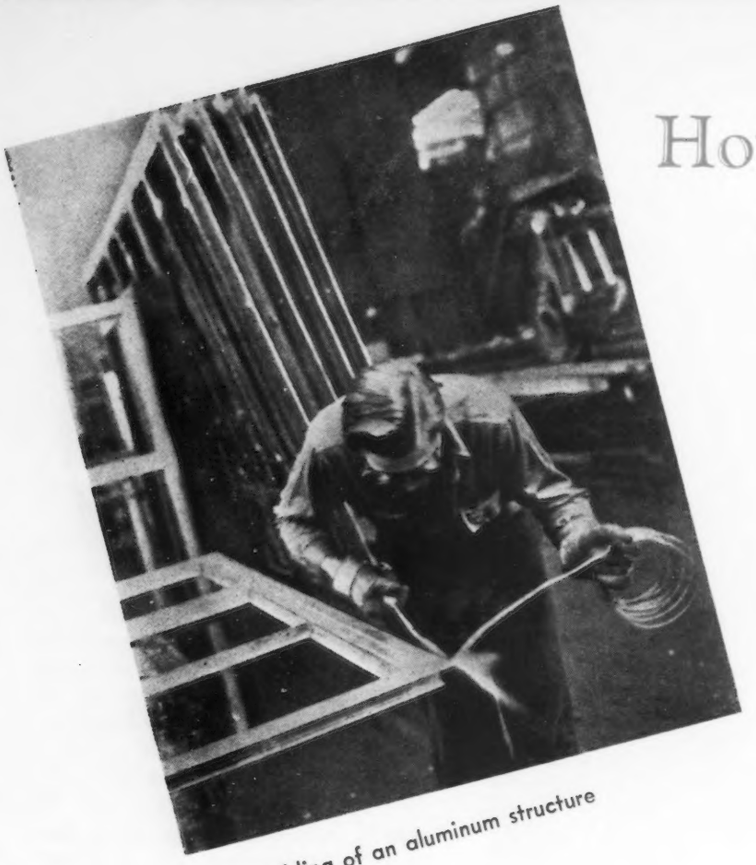
To check the spline dimensions in production after both hobbing and gear shaving operations, an 0.080 in. diameter wire is inserted between the teeth on opposite sides of the spline, the size being such that the wires do not bottom in the splines. Following the hobbing operation the limits are from 1.915 to 1.917 in. across the wires. After the shaving operation the limits are from 1.9075 to 1.9085 in. Actually the limits on tooth form are much closer than these figures in both cases, due to the fact that the contour of the teeth on the splines multiplies any variation in dimensions several times, as far as radial displacement of the wire is concerned. Accurate gaging of the tooth dimensions shows that they seldom vary more than 0.0001 in. and never exceed 0.0002 in.



SPECIAL indexing fixture for broaching the conjugate involute splines in the propeller shaft ends which mate with the splined ends of the universal joint yokes. Since the work is performed in three stages, provision is made to return the tools through fixed guide tubes located between each work station. Between operations the fixture is therefore indexed twice, 30 deg. at a time, and the indexing base plate has 12 notches.

The mating part — the propeller shaft end, is broached to similarly close tolerances. This operation is performed on a broaching machine equipped with three broaches and indexing table, carrying six work-holding fixtures. Broach tools are Colonial precision high-speed steel type and successively broach the tube and then semi-finish and finish the splines in it. This part when assembled over the spline slides smoothly from end to end without either measurable backlash or wobble. Due to the method of producing the parts, the type of fit secured is identical regardless of the relative angular positions in which the mating parts are assembled. The fit is frequently checked with master internally splined gages to maintain this condition in all shaft assemblies produced by this company.

How to Weld Sheet Aluminum



Torch welding of an aluminum structure

FUSION welding technique with the oxy-acetylene flame has solved many problems in the fabrication of aluminum and aluminum alloy sheets, according to A. J. T. Eyles in a recent issue of *Sheet Metal Industries.*

It is known to those who have attempted to weld sheet aluminum by this method that the melted edges do not flow together properly, as in the case of mild steel sheets, where the melting point of the oxide is lower than that of the metal. The molten aluminum spreads in globular form under the influence of the acetylene flame. The metallic globules consist of pure aluminum within a coating of oxide of aluminum which has great power of resistance to the welding flame, and, on cooling, the edges of the metal remain unjoined. Hence the need of a good flux to dissolve and deoxidize the oxide film and permit the fused metal to flow together.

For successful sheet aluminum welding, it is necessary that proper fluxes be employed. Fluxes prepared by welding operators are seldom economical or satisfactory. The manufacture of these fluxes necessitates care in the selection of materials and compounding to secure commercial purity, correct proportions and intimate mixing.

Aluminum welding fluxes should be kept in airtight containers when not in actual use, as they are very hygroscopic. The best fluxes are those used in the dry condition. The most effective method of applying the flux is to dip the heated end of the welding rod into the flux and melt up the tuft which then adheres to form a thin varnish along the rod for 3 in. to 4 in. It should be unnecessary to apply more flux to the weld than that which will varnish the rod. Too much flux is harmful as well as wasteful. The gradual melting of the rod will automatically feed flux on the weld joint just where it is required. When a welding rod is not employed the flux may be mixed with alcohol or methylated spirit and applied to the sheet edges with a brush.

The use of a welding rod or strip is necessary with everything but very thin sheets. Pure aluminum should be welded with a rod of similar composition, and aluminum alloy sheets should be welded with a rod of the same alloy. For thin aluminum sheet the welding rod may be a strip cut from the same sheet having a width of two or three times the thickness. More generally, a round wire is employed, and suitable diameters are given in the accompanying table.

For sheets less than No. 18 s.w.g. (0.048 in.), the edges to be welded should be flanged at right angles. No welding rod is then used, since the flanges fuse down and provide the necessary filling metal. These flanges should be from one and a half to twice the thickness of the metal. For aluminum sheets or sections 1/16 to $\frac{1}{8}$ in. in thickness it is preferable simply to butt the edges together. When the metal is above $\frac{1}{8}$ in. in thickness the edges should be bevelled to an angle of 45 deg., so as to form a right angle at the weld; thereby permitting a ready penetration through the whole thickness.

Welding Essentials

In preparing to weld, the edges of the metal and the areas near the weld joints should be absolutely clean. Dirt, grease and foreign matter will contaminate the weld, and will cause cavities which may seriously reduce the strength of the joint.

In the actual operation, the blowpipe flame must be carefully regulated and the correct adjustment of the gases maintained. Proper adjustment is secured with a very slight excess of acetylene, although the neutral flame can be used satisfactorily. The smallest excess of oxygen in the welding flame should be carefully avoided, as this will oxidize the metal rapidly. The tip of the white cone of the flame should never come in contact with the metal, because the high temperature of this part of the flame tends to produce holes in the metal—particularly thin sheet sections—which are by no means readily repaired. The tip of the white cone should be $\frac{1}{8}$ in. to $\frac{1}{4}$ in., varying with the thickness of the metal.

The blowpipe should be inclined at an angle of about 35 deg. from the plane of the weld—and its motion should be away from the welding operator. The flame should be so applied that both sides of the joint will be heated and melted equally and simultaneously. When welding has commenced it should progress to completion without interruption. Sheet aluminum welds should be expeditiously executed from the moment the first fusion is obtained. The speed of welding is not uniform, but accelerates as the weld proceeds. A competent weld-

ing operator displays his skill on aluminum in the manipulation of the welding flame at the right moment when fusion has proceeded so far that complete welding is assured; dexterity in preventing the deformation of the metal under the heat of the welding flame, and the rapidity and ease of the operation.

Sound welds, in aluminum sheets, possess a degree of strength practically equal to that of the sheet; and the joints present a neat and finished appearance, are homogeneous in structure, and are of a very satisfactory character. After the weld is completed, the welded joint and the surrounding metal must be thoroughly cleaned by washing and brushing with warm water to remove all traces of the flux, thereby preventing subsequent corrosion of the metal. In some shops the welded products are first immersed in a 10 per cent solution of sulphuric acid, and afterwards are rinsed in warm water or subjected to a steam jet to remove all traces of the flux. The latter method is beneficial in removing all traces of the flux from corners and crevices.

Sizes of Welding Rod for Sheet Aluminum

Thickness of Sheet to be Welded, In.	Diameter of Welding Wire, In.
0.040 and under	0.080
0.040 to 0.048	0.092
0.048 to 0.064	0.104
0.064 to 0.080	0.116
0.080 to 0.104	0.128
0.104 to 0.128	0.144
0.128 to 0.160	0.160
0.160 to 0.212	0.176
0.212 to 0.252	0.192

When practical it is advisable to hammer the welds, as this tends to relieve the contraction strains set up during the cooling of the weld and adjacent metal. Hammering, however, will not be sufficient to break down the cast structure in the weld completely, but it will eliminate the cast structure to some extent, and thus produce a more nearly uniform condition throughout the product. This practice will also tend to obliterate any surface porosity that may be present in the weld.

It may be of interest to mention that Mr. Eyles has welded 27 pieces of aluminum sheet together as a specimen of aluminum welding. The welded seams or joints were hammered flat and polished, and it was very difficult to locate the lines of welding.

In conclusion, it may be safely said that the oxy-acetylene method of welding sheet aluminum products has been of incalculable value in industry; it is true that rapid strides have recently been made in the art of electric resistance and arc welding of these alloys, but instead of displacing fusion welding technique with the oxy-acetylene flame, these methods fill an independent field and provide additional tools for fabricating sheet aluminum.

Protecting Crane Men Against Poisonous Fumes

IN locations where dangerous gases and fumes are present, crane cab operators need special protection, since the gases usually rise and since the operator is confined in his cab and therefore more suspectible to them. In the Utah plant of one of the country's largest smelting companies an analysis of the air in a crane cab showed a sulphur dioxide content of 25 parts per million, although a concentration of only 3 parts per million is considered definitely harmful to human beings after several hours' exposure.

To overcome this condition, Dorex gas adsorption equipment was recently installed by the W. B. Connor Engineering Corp., New York, in the crane cabs of the smelter to safeguard the operators' health. In principle, the air for ventilating the cab is drawn in through a field of highly activated coconut shell carbon which frees it of all traces of the poisonous sulphur dioxide. The air within the cab is constantly re-circulated and is likewise treated to remove all poisonous odors and gases. The installation is flexible and if space permits may be housed entirely within the cab. The coconut shell carbon of the adsorber can be reactivated over and over again.

New Book On Aircraft Tubing

NOW available is a well illustrated book, entitled Aircraft Tubing Data, edited for the Summerill Tubing Co., Bridgeport, Pa., by John E. Younger of the University of Maryland. In four sections data are given which should prove invaluable to aircraft engineers.

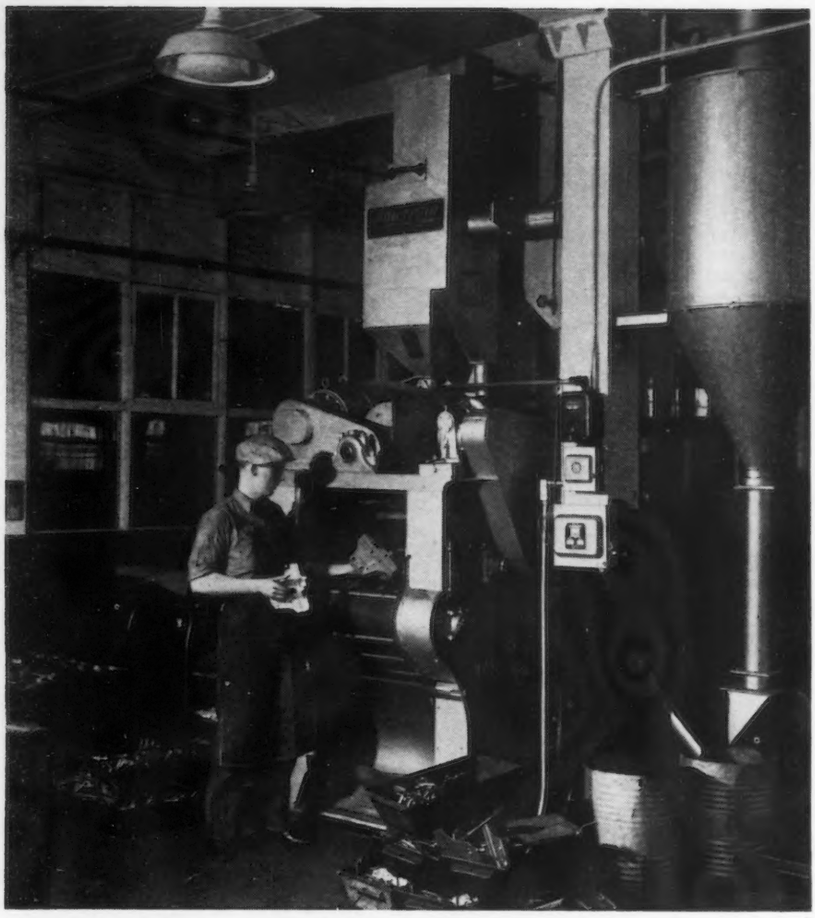
The manufacture of seamless tubing is described, and dimensional, chemical and mechanical specifications and tolerances are given for the steel used by A. J. Williamson of the Summerill Tubing Co.

In the second chapter authorities discuss extensively the welding of tubing by the oxy-acetylene, arc and atomic hydrogen processes. Useful photographs and diagram may give hints to engineers towards improvements in their technique. Bending, magnaflux testing and corrosion protection of aircraft structural parts are also described by authorities in these fields.

Next, formulas for aircraft tubing receive attention. Design data for the physical properties of SAE 1025 and X 4130 steels are given for various sizes of tubing, also of ovals, streamline and square sections. An appendix contains information of more general application: conversion tables, functions of numbers, etc.

This book is available to the public at $2.00 with a ring binder and deluxe cover, at $1.50 with wire binder and fiber cover.

Abrasive Blast Cleaner Reduces Burr Removal Costs



VIEW of the 20 x 27 in. Wheelabrator Tumblast installed at the Acme Steel Co., Chicago. This machine is used continuously for cleaning and removing filings and burrs from machined parts.

o o o

REMOVING burrs from machined parts can be a most vexing and expensive problem. Usually it is done manually, either by grinding, filing, or scraping.

In one plant producing small parts on automatic screw machines, the problem was of such consequence that the entire production schedule was thrown off balance. Someone suggested that the burrs might be removed by blasting with a fine metallic grit in the Wheelabrator Tumblast, an airless blast cleaning machine, produced by the American Foundry Equipment Co., Mishawaka, Ind., which was used in another department. The idea was tried, and the result was found satisfactory.

Another manufacturer was confronted with an equally difficult burr removal job. He had booked a large order for small steel shafts from a customer who demanded a perfectly clean finish. Trouble arose when it was found that a long burr remained in the cut after notching one end of the shaft. Grinding the burr promised to be a costly and cumbersome process. The producer was faced with the loss of his entire profit on the job unless he could remove the burrs faster and at less expense. After some experimentation with various abrasives it was found that a small Wheelabrator Tumblast would remove the burrs perfectly. As a result a machine was installed. Later the manufacturer reported that savings on this job alone repaid the investment.

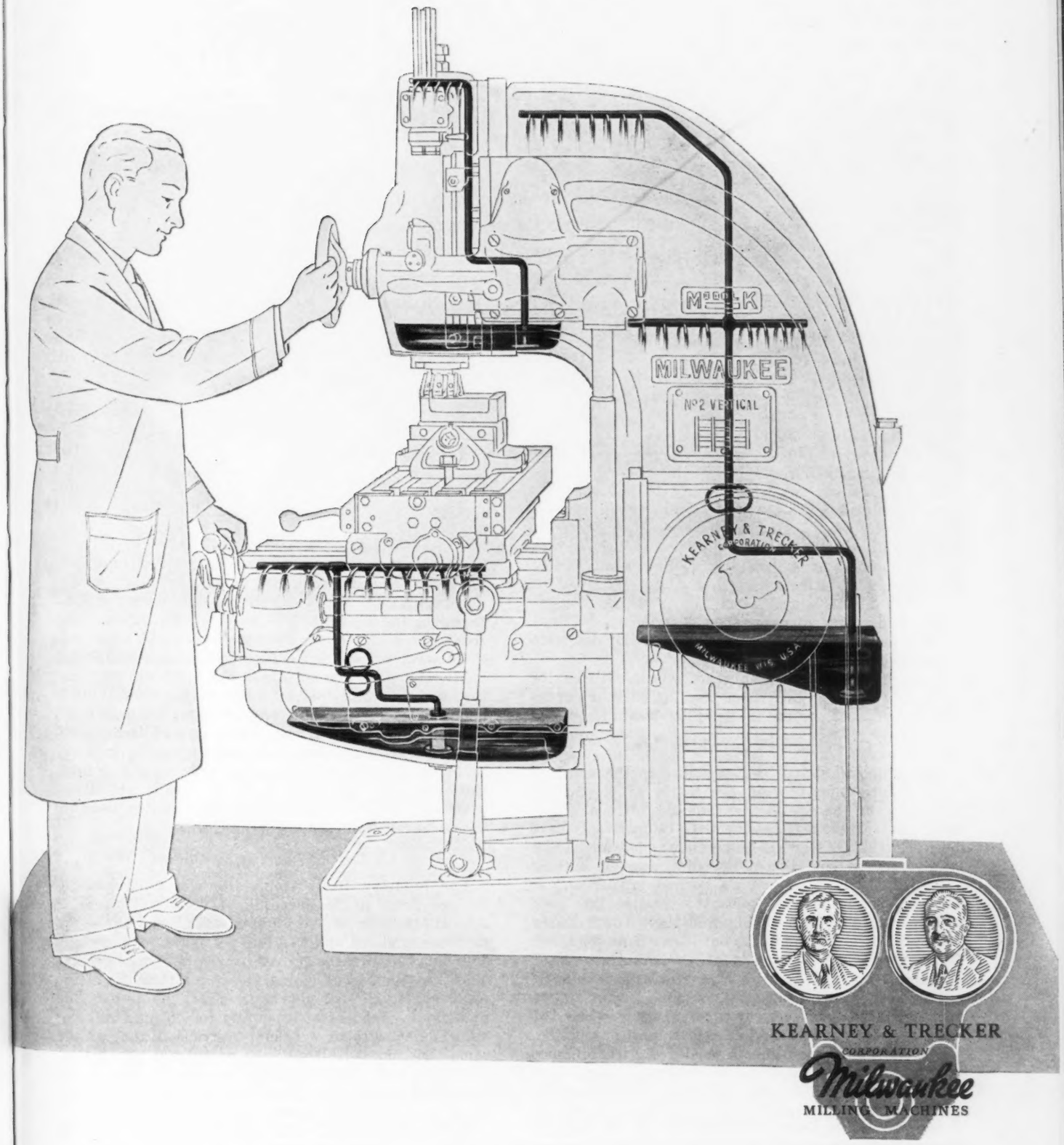
In another instance, burrs were forming on the end of coiled springs during the grinding operation, because the heat generated was sufficient to weld some of the fine steel particles that were ground off. A few minutes' blasting in a Wheelabrator Tumblast removed the troublesome burrs from these springs.

These are only a few of the many burr removal jobs being handled by the airless abrasive blast cleaner. Generally speaking, the process can be successfully used for this purpose whenever blasting the product with a fine grit is not an objection.

In instances where the finished part is later plated, enameled, or given any other finish such as lacquering, metallizing, painting, etc., Wheelabrating not only removes the burrs but also provides an excellent bond for the subsequent coating. This has been demonstrated with bolts that were to be sherardized. The threads were cleaned up and the surface was prepared for final coating at the same time.

Lubrication—vital to the life of any machine—is provided in the Milwaukee Milling Machine by automatic pressure pumps in the column and knee, and in the sliding head on vertical machines. Automatic pump lubrication of this type requires only a minimum of attention.

KEARNEY & TRECKER CORPORATION • Milwaukee, Wis., U. S. A.



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CORPORATION
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MILWAUKEE MILLING MACHINES

On The Assembly Line

BY W. F. SHERMAN
Detroit Editor

• Automobile industry sees possibility of some curtailment, but does not know how much . . . Objects to reduction of output by edict . . . 30,000 more midget blitz buggies may be ordered . . . Auto output hard hit by Ford strike.

DETROIT — Recognizing the strong possibility of some curtailment in automobile production, observers have groped to find the pattern or outline of the curtailment program. It has been their hope thereby to be able to reduce the industry's wartime future to a scale that could be grasped and interpreted.

This much was acknowledged and explained in some detail in this column on April 3 because the industries which depend upon automotive buying for their existence, or for part of their existence, have a tremendous stake in what happens to the automobile industry.

The auto industry itself has followed a consistent program in maintaining its normal place in the American business scene, while at the same time taking on huge defense orders and agreeing to subjugate its peacetime business to the job of building for defense. Its policy has been stated most clearly in the subjugation resolution of the Automobile Manufacturers Association, adopted early last fall. But, epigramatically, an outstanding leader of the industry phrased it just the other day in words which all American industry might well adopt whenever they fit.

"Tell us what to do, and we'll do it; but don't tell us *not* to build automobiles," he said.

That, in the fewest number of words, will be the industry's rallying call when, and if, curtailment *by edict* is proposed for the industry by Washington.

Curtailment by Edict May Come

And proposed it will be, according to the most reliable information now in the hands of responsible executives of the automobile industry. Not a grapevine, but rather real channels of information, have disclosed that in certain government quarters there is advocacy of curtailment by edict, possibly cutting one-third from the industry's normal production. It has been predicted by a topmost executive that such an edict might be published by mid-May. The industry cannot fight it, if it happens, but it can hope for saner thinking to stave off such a fateful and unwarranted interference. If, as Charles F. Kettering has so aptly expressed it, automobile mass production is simply the "publishing" of one car after another—then fiat restrictions might be called a censorship of production.

Reasons for opposition to a decreed curtailment center around the questions of employment and productivity. Any halt in automobile production lines or assemblies would merely throw out of work thousands of men for whom there are as yet no jobs in defense industries. In the name of common sense, these men might as well be kept at the job of building automobiles as long as materials are available and then switched to defense jobs if necessary. A mere transfer of men from auto plants to airplane or engine factories is not being proposed in any instance, however, since training-programs and upgrading are being counted on to supply the necessary personnel.

One of the best thinkers in the industry—one who has established a reputation by having solved some difficult problems in bringing his organization up from the lows of the depression—believes that productivity of all industry in its normal spheres is essential to provide the national income which will make the defense program, at least in part, a pay-as-you-go proposition. He points out that unnecessary restriction of automobile production will take a big slice out of national income at a time when it is needed.

There seems to be no special fear in the industry of excise taxes, as long as they are not discriminatory against the automobile. Even if curtailment of sales and production is introduced normally as a result of taxation, the industry will not feel that it has been treated in a basically unfair manner.

In other words, important individuals in the industry (who, in the mass, *are* the industry) say that they will accept any defense tasks within their abilities and will carry them to completion in the industry's most efficient manner, and will accept philosophically the necessary curtailments brought upon the industry by physical shortage of materials or by equitable taxation, but they object to implied threats and direct promises that they soon will be *forced* to stop building automobiles.

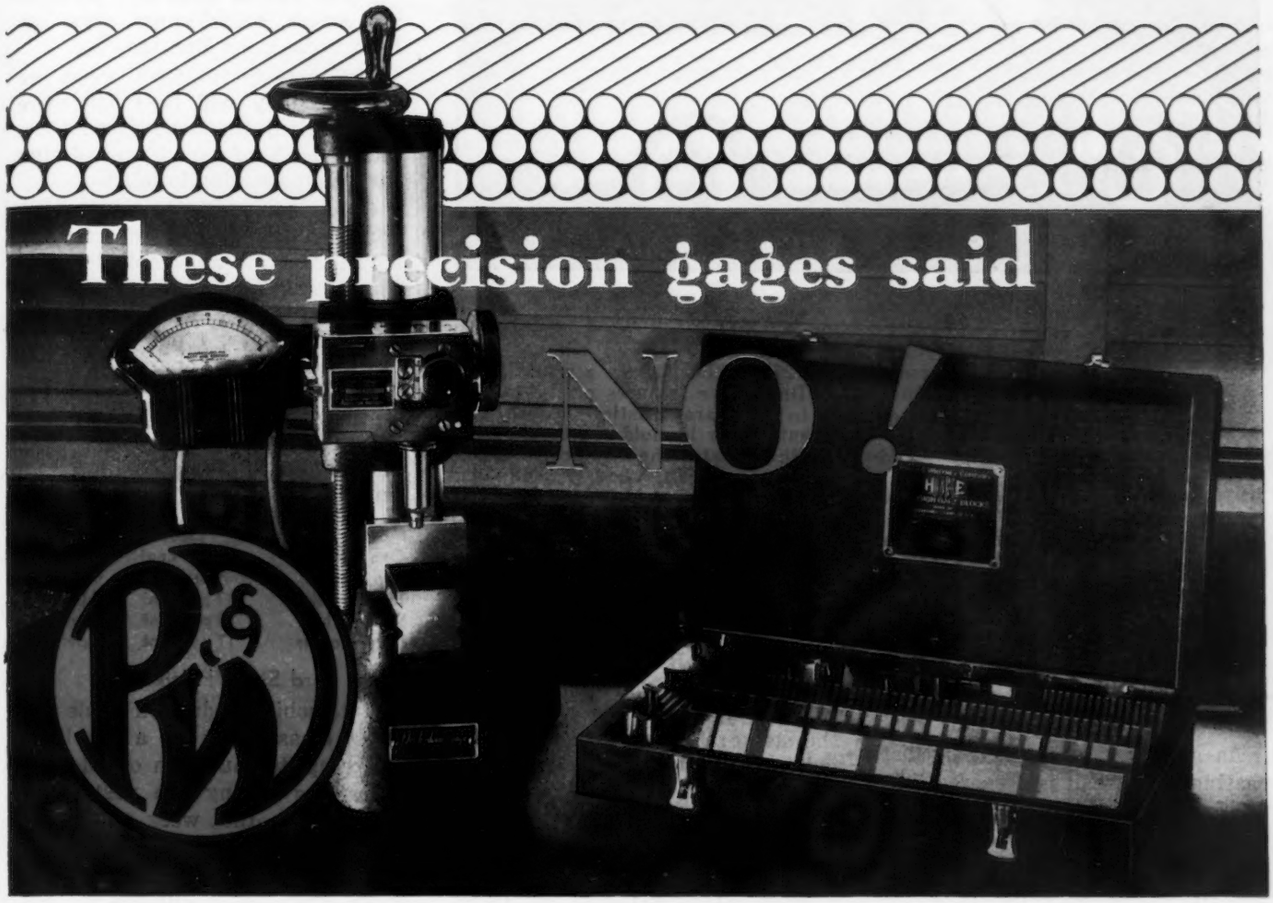
No Special Pleading by Industry

The industry itself seems to have purposely refrained from special pleading of its own causes. It sees at the helm of the OPM a leader who knows its problems and its abilities and its place in American life, but who would lean over backward lest he become a special pleader. Yet there is need today that the American public should know that the automobile industry is confident of its ability to continue building automobiles without artificial restriction and, at the same time, do a "full-out" job of defense production. It has already felt the initial burden of tooling for tanks and planes and guns, and is equal to the task of all of those, plus automobiles.

Most vitally needed today is a clarification, once and for all, of government policy on the question of per-

ALL SCRAP?

200 PRECISION GROUND SHAFTS



Hear the story. . . . . .

A large company was doing vital national defense work. Among its many activities were two hundred precision ground shafts . . . small pieces required to be accurate within a few ten-thousandths of an inch. The inspectors, using their regular gaging methods, *rejected over 190 of them!*

Immediately there was a controversy between inspection and shop. To settle it a disinterested third party was brought in. He used a PRATT & WHITNEY Electrolimit Comparator and P&W Hoke Precision Gage Blocks . . . both accurate to millionths . . . instruments that could not be questioned. They proved that 187 of the 190-odd rejected shafts were comfortably within the close limits specified. And of equal importance—both shop and inspection agreed that it was a correct finding.

There you have the definite advantage of dependable precision. A serious but useless loss in precious time, badly needed material, and money was averted. Such things happen every day when fine precision work is checked with slightly worn or inferior gages. Modern precision gaging methods prevent that loss.

Bring your precision gaging problems to a PRATT & WHITNEY Gage Engineer. He can show you how to put PRATT & WHITNEY *accuracy* to work and make it pay big dividends in your shop. He can help you enormously. *There is no better paying investment than the right gages for the job!*

PRATT & WHITNEY

Division **Niles - Bement - Pond Company** • **West Hartford, Connecticut, U. S. A.**

THE NEW PACKARD CLIPPER is now making its appearance throughout the country. It is mounted on a 127-in. wheelbase (same length as the smaller Packard 120) but has an over-all length of 219⅞ in. compared with 206¼ in. for the smaller Packard. Horsepower is 125, developed from a refined, high compression version of the 120 engine. Distinctive features of the car are the modern streamlining with retention to the characteristic Packard "life-line" and radiator grille styling. The front fender is molded into the front door panel, fading out about midway in the panel. The body construction is unique in that the rear fender and quarter panel of the body is made of a single stamping as is the front fender and hood side panel. Where two-color paint jobs are used, the darker shade is employed on the body super-structure (see "Assembly Line," Feb. 13, 1941).

mitting American industry enough elbow room to take a full swing at the ball, to show how well it can do the jobs it accepts, both for defense and peace.

As a matter of more than just passing interest, it is observed that nothing has come out of the priorities situation yet to stop automobile production, or even to curtail it, if the industry is given an opportunity to "work its way around" its problems.

The midget blitz buggies promise to become an important part of the auto industry's defense production, with orders in the offing for 30,000 of this vehicle. So far, they have been ordered only in lots of 1500 each from Bantam, Ford and Willys. Ford production was well under way but was interrupted by the strike; Bantam's production is going ahead at a normal pace, although some interruptions have been reported; Willys probably will not be in production until late spring or early summer.

With Army demand for these vehicles reported on the increase, augmented by the requirements of the Marines and the British, a fourth concern is now reported to have become eligible to make such cars through a licensing agreement. If the order for 30,000 is placed, this company may obtain some of the business. This concern is the Checker Cab & Mfg. Co., Kalamazoo, which, a spokesman says, has been licensed by Bantam.

Undoubtedly if 30,000 more are ordered, they will be much more standardized than the present vehicles, each of which has design variations peculiar to itself.

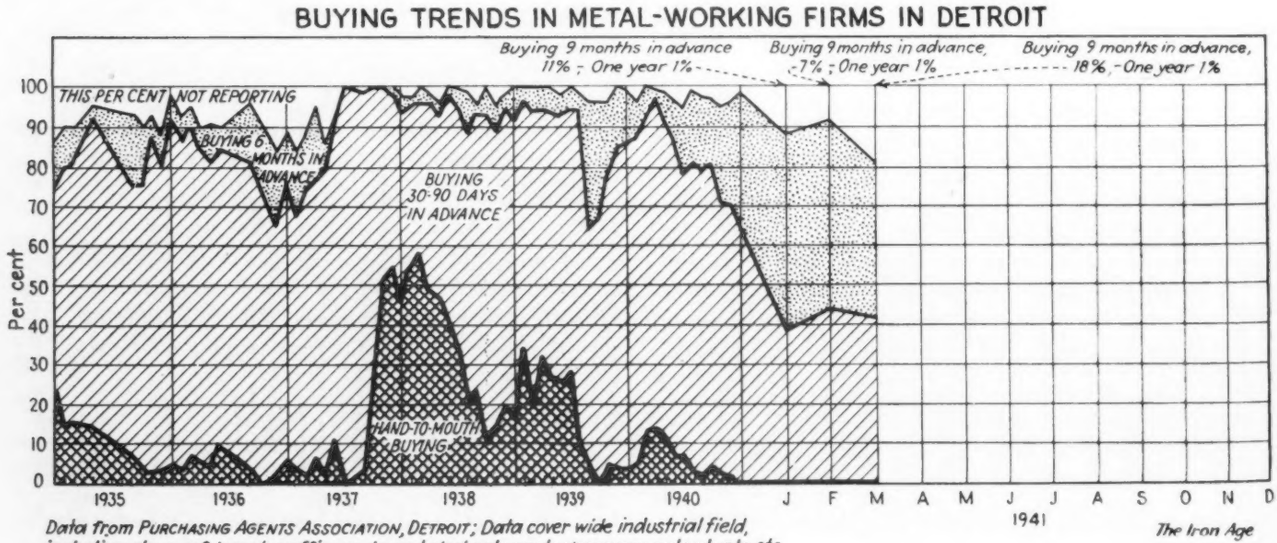
Only minor adjustments are noted in the figures representing advance buying as compiled by the Purchasing Agents' Association of Detroit for the month of March. As in February, 1 per cent of the buyers continued operations on a hand-to-mouth basis. Also 1 per cent continue to report that their buying sights were aimed at 12 months hence. The other buyers reported as follows:

	February	March
One month	1 per cent	3 per cent
Two months	5 per cent	4 per cent
Three months	37 per cent	34 per cent
Six months	38 per cent	39 per cent
Nine months	17 per cent	18 per cent

Ford Strike Hits Output

Automobile production totals suffered disastrously as a result of the complete shutdown of all Ford operations during the past week. Output for the week was only 99,260 passenger cars and trucks compared with 116,255 in the previous week (also affected by the strike), and 101,940 in the corresponding week of last year, according to Ward's Reports, Inc. Resumption of Ford activity will not be fully reflected in production totals before next week.

BUYING TRENDS IN METAL-WORKING FIRMS IN DETROIT



Data from PURCHASING AGENTS ASSOCIATION, DETROIT; Data cover wide industrial field, including stove, refrigerator, office equipment, steel, auto parts, accessory, auto plants, etc.

ARE YOU CASHING IN ON THESE CARPENTER "Time Savers"

Here's help—timely help—that can boost the output of your plant, substantially reduce production costs, and relieve pressure on the tool room.

Why not use that help now? You will never need it more than you do today—when every tool room is hard put to find enough minutes in the day.

Sure it talks about Carpenter Tool Steel—but what's that got to do with the hard, down-to-earth factual information it will give you to solve perhaps the very tool problem that has your tool maker worried right now.

What he needs are facts—facts about better tool hardening methods—facts about tool design as it affects the choice of tool steel analyses—facts on machinability of tool steels—facts on the causes and cures of delaying tool troubles—facts that are clear, simple, straight-shooting and easy to understand—facts to help him make each tool better and more productive.

If he is one of the thousands upon thousands of tool makers who already have all or some of these time-savers, make sure he is using them to their fullest extent. If you don't have this information on hand—write us today. The textbook, "Tool Steel Simplified," is ideal for apprentice training courses. It costs $1.00. All the other literature shown will be supplied free to any tool steel user in the U.S.A. when requested on your company's letterhead.

THE CARPENTER STEEL CO. 121 Bern St., READING, PA.

Carpenter MATCHED TOOL STEELS

Executives: That book in the man's hand is for you. Tells how to find *extra* capacity hidden in your plant. 14 minutes to read. Write for your copy. Free, when requested on company letterhead.

Washington

BY L. W. MOFFETT
Washington Editor

• Congressional inquiry is intended to shed light on how people's billions are being spent for defense . . . Moffett suggests that members themselves be called to testify about their efforts to get defense plants for home towns.

WASHINGTON — Congress is about to start a thorough inquiry into the defense program, not a witch hunt, but intended to learn whether there has been waste—or worse—in connection with the placing of some $14,000,000,000 in defense contracts. Evidence developed supposedly will be used to rectify defects in the hastily organized defense and to give improved direction of eventual expenditures which it is now estimated will amount to $40,000,000,000 or more.

Conducting a complete and impartial inquiry along the lines of its announced purpose at this time is wholly desirable. It is preferable that the study be taken up while the defense program is still in its early stages rather than waiting until it is completed and, therefore, too late. Witnesses from the Government, industry, and labor will be called, and just as they deserve a fair hearing, so, too, they should give the committee all the evidence they can. There undoubtedly will be found evidence of inefficiency. Nothing else could be expected from the efforts to mobilize overnight the vast resources of a country, beginning almost from scratch. On the whole, however, it already is clear that remarkable achievements have been made in certain parts of the program and this credit deserves to be balanced against the mistakes made.

The investigation will be made on the Senate side by a special committee headed by Senator Truman, Democrat of Missouri. On the House side there will be two committees, one headed by Representative May, Democrat of Kentucky, and the other headed by Representative Vinson, Democrat of Georgia, chairman of the Committee on Military Affairs.

Questions on Defense Plant Sites

One subject will deal with the way contractors are selected and what types of contracts they get. The War and the Navy Departments and OPM officials will be asked regarding policies in selecting defense sites. They will too, of course, have brought before them for answer the much discussed question whether small business is getting its share of defense contracts. The effect the defense program has had on the migration of labor will be developed. Inquiry will be made to learn whether practices of management or labor in regard to prices, fees and charges have acted to increase defense costs. Progress of the defense program and its beneficiaries will be inquired into.

The very nature of the study—the purported desire to prevent waste—suggests that the inquiry should not be confined to labor, management and executive branches of the Government. Instead members of Congress might be called to the stand—it would be a parade — and asked to state frankly just how they can reconcile this desire to prevent waste with their legislative participation the past few years in appallingly extravagant expenditures. Even as the plans for the investigation were getting under way Congress, its eyes cocked on a political background, voted outrageous appropriations for farmers. The House went on a spree to the tune of more than $1,000,000,000, and the Senate, with only nine dissenting votes, went on an even worse bender, upping the total to the unprecedented sum of $1,340,000,000 or $455,000,000 above the budget estimates and its estimates certainly are extremely lavish. The contention of political-minded supporters of this sort of callous indifference to waste was that because so much is being spent for defense, the farmers were entitled to more and better subsidies. The point obviously is disingenuous. There was no possible excuse, except on purely political grounds, for such reckless appropriations. On the contrary, the position of the farmer today is such that he is no more entitled to such handouts than are many groups who do not receive benefits from the Federal treasury. Defense, it will be readily agreed, rises above dollars, but that doesn't mean that non-defense dollars should not be conserved in order that they can be spent, if necessary, for defense.

Distribution to Small Plants Sought

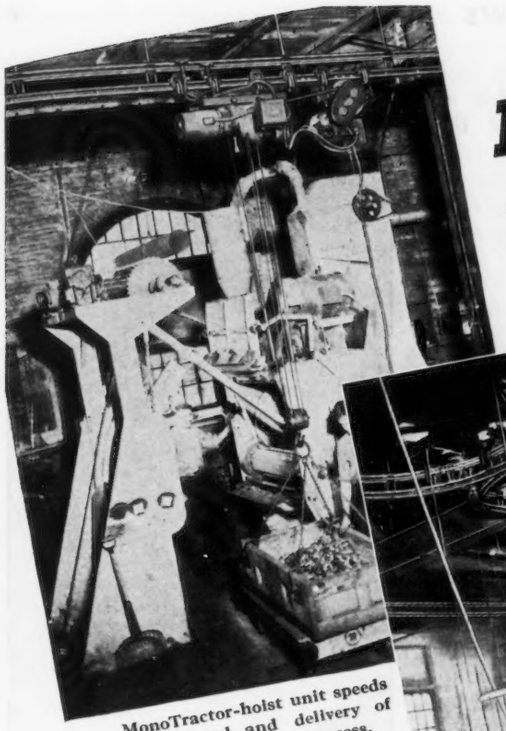
Members of Congress might also be asked what pressure, if any, they have exerted toward having sites for defense plants located in their districts or States, resulting in sharply increased land prices, giving no heed to whether the location is or is not strategical.

The wide distribution of defense orders to small business is an effort that OPM long has worked on and continues to work on. If the Congress inquiry can expedite the plan on a sound basis it will have accomplished a great deal. In passing it may be added for the benefit of those who charge big business with getting so much of the defense business, that there are any number of big plants that would be only too pleased to farm out defense orders. Unfortunately for big business and little business, and the defense program itself, too often this has not been found to be possible.

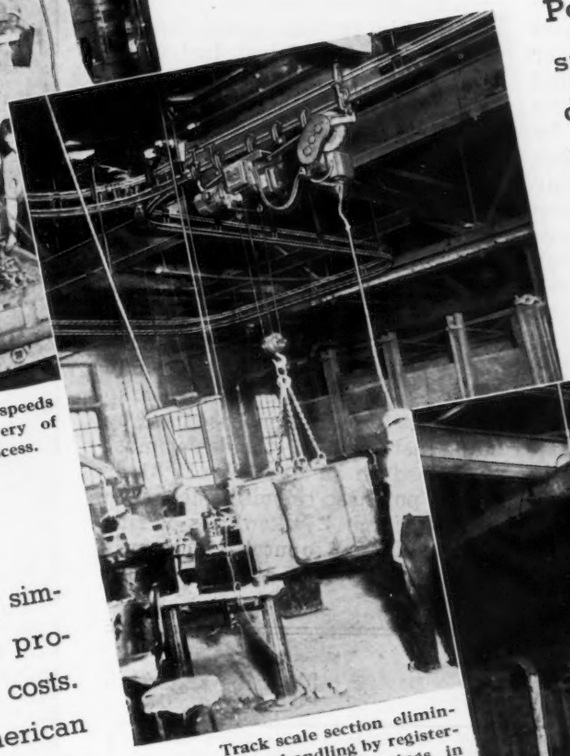
If the investigation committees really go into it

MECHANIZE your simple jobs!

Power operation will speed up your production and cut down handling costs.



MonoTractor-hoist unit speeds up removal and delivery of castings to cleaning process.



Track scale section eliminates rehandling by registering weight of castings in transit.

Heavy loads are easily and quickly moved by power operated equipment.

It's the time-consuming, simple jobs that tie up production and pile up costs. Hence, when an American MonoTractor with electric hoist takes over the handling operations, bottlenecks disappear, materials move smoothly between process and costs inevitably fall.

With their specialized experience, American MonoRail engineers are often able to discover hidden possibilities for the application of simple handling systems that bring an immediate return from a small investment. This service is available from district offices located in every industrial center.

THE AMERICAN MONORAIL CO.

13103 ATHENS AVENUE, CLEVELAND, OHIO

How Problems are Solved!

Write for copy of this "Blue Book" containing hundreds of illustrations showing solutions to a wide variety of handling problems.

thoroughly they will find a lot of substance can be unearthed respecting management and labor practices in regard to prices, fees and charges and whether they have acted to increase defense costs. Already much material is available —volumes of it. There have been price increases that deservedly have been condemned and knocked down by the Government. But little or nothing has been done regarding extortionate fees, dues and charges ruthlessly assessed on laborers by racketeering unions. Mr. Vinson has made it clear that he is ready to do something about it. But unless the Administration itself gives the go ahead signal—of which there is at present no prospect—it is doubted that anything will be done about it.

↓ ↓

Washington

• • • **The Price Stabilization** Division has relaxed its zinc price fixing order of March 31, to give greater recognition to existing contracts and to permit the delivery under certain conditions of zinc scrap and secondary slab zinc at prices above those fixed by the order.

The March 31 order had the effect of abrogating pre-existing contracts so far as price was concerned although deliveries of slab zinc were permitted through April 3 at prices higher than those fixed by the order. The latest instruction was prompted by reports of hardships which the division had not anticipated and permits deliveries of both slab and scrap zinc under certain specified conditions at higher prices where commitments were made prior to March 31.

Here are the specified conditions, which also are applicable to secondary slab zinc:

(1) The dealer's firm commitment must have been made prior to March 31 for the sale of zinc scrap at prices higher than those fixed by the order; and (2) the dealer must have had on hand on March 31 or under purchase commitments made before March 31, quantities of zinc scrap sufficient to meet the commitments and acquired at prices higher than those fixed by the government.

The division through Leon Henderson, Commissioner of price stabilization, reiterated that complaints of hardships can be referred to the division by filling out a newly-prepared form or by communicating the details of the inequity to the division.

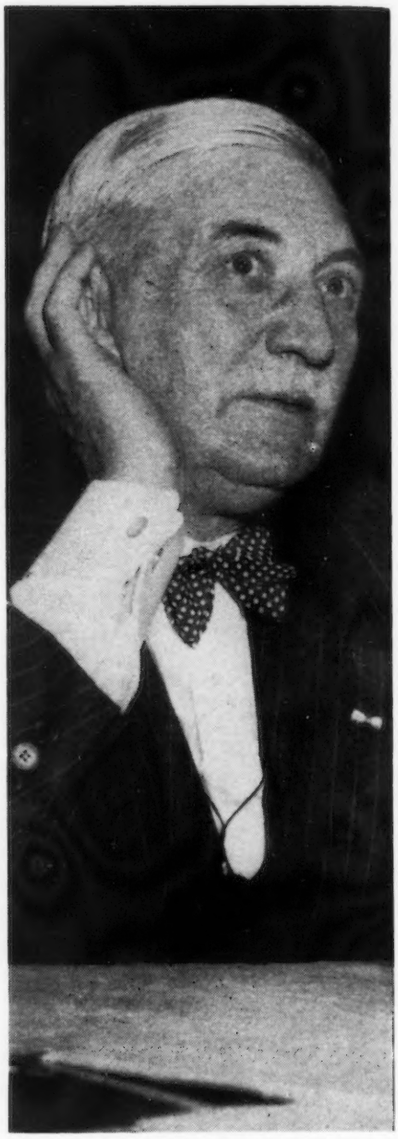


Photo only by Harris-Ewing

ABOUT STRIKES: OPM Director William S. Knudsen, above, has just told the House Military Affairs Committee investigating defense strikes that (1) wage-hour strikes can be handled successfully, (2) organizational strikes are bad to deal with and (3) jurisdictional strikes are "just plain stupid."

THE BULL OF THE WOODS — BY J. R. WILLIAMS

Machine Guns 9% Ahead of Schedule

Washington

• • • **Production of** .30 caliber and .50 caliber machine guns was 9 per cent ahead of schedule for March, it has been announced by the OPM. These guns, which are mounted on aircraft, tanks, and scout cars and used by ground troops, are being manufactured at the present time only by the Colt Patent Firearms Co., Hartford, Conn.

Other plants for the production of machine guns are nearing completion and it is anticipated that output will increase sharply in the very near future. Both the .30 and .50 caliber machine guns will be in production eventually in six plants. The OPM and the military services are seeking to increase monthly production of .50 caliber machine guns by 500 per cent and .30 caliber guns by nearly 1000 per cent by the end of the current year.

Production of ammunition for the .30 caliber machine gun, which is interchangeable with ammunition for the Garand semi-automatic rifle, increased 36 per cent in March over February.

U. S. Manganese Ore Production Gains

Washington

• • • **Domestic production** of manganese ore containing 35 per cent or more manganese (natural) during the month of February, 1941, was 2500 long tons, according to the Bureau of Mines. In January, production was 2100 tons, shipments were 2200 tons, and producers' stocks at the end of the month were 2200 tons. The rate of shipments averaged 2442 tons monthly in 1939, when the total amounted to 29,307 tons. Arkansas, Georgia, Montana, Tennessee, Virginia, and West Virginia reported shipments of manganese ore in February.

Imports in February of manganese ore, 35 per cent or more contained manganese, totaled 44,928 tons, manganese content. India was the largest supplier, furnishing 25,385 tons. Other sources were: Union of South Africa, 12,913 tons; Cuba, 5619 tons; Brazil, 947 tons; Philippine Islands, 49 tons and Bolivia, 15 tons.

ON THE WEST COAST

Enlarged plane program would strain aluminum industry . . . Export licensing restrictions slow Coast shipments . . . San Francisco machinists' strike ties up $7,000,000 defense orders . . . Mass X-ray inspection increases use of airplane castings.

REPORTS of a shortage of fabricated aluminum aircraft parts are mere creaks and squeaks of a rapidly expanding industry increasing its production speed. If President Roosevelt has correctly judged the size of the cloud of planes needed to obliterate the now bright Nazi sun, the aluminum industry will be able to bear its load without major difficulty. If, however, the plane program is fluffed up to, say, 80,000 planes by 1943, aluminum facilities will take a lot of bracing to keep from cracking under the strain. That is the contention of a Coast producer.

Pacific Coast expansion plans of the Aluminum Co. of America and the projected new plant of Reynolds Metal Co. are carefully geared to aircraft and other defense needs under the present pattern. If the actual program is cut according to this pattern the industry is confident that it can meet all demands, but there are misgivings that the program may put on weight.

No shortage of aluminum for defense purposes is visible today, although there are delays in fabricating it. So far as can be independently determined, every plant with a top priority rating has received all shipments on schedule. No manufacturer of aluminum airplane parts has been closed due to a shortage of this material. What additional pressure may be put upon material suppliers by plane manufacturers working ahead of contract schedule is not yet apparent. Vultee Aircraft exceeded its contract schedule by 30 per cent during March in the production of BT-15 basic trainers for the Army Air Corps, company officials proudly announced last week. The BT-15 is a two-place monoplane used for pilot training at the Army air training centers throughout the country. So far, announcements of this sort are rare.

Necessity for extensive range riding in the State Department export licensing program has slowed down legitimate steel exports considerably. This delay, plus the pronounced shortage of bottoms, is giving foreign steel buyers dependent on shipments from Coast ports a long wait before receiving their orders. One San Francisco firm upon receipt of an order under 100 tons from a Philippine Island customer made prompt application to Washington for the necessary export license, but did not receive this authorization until four weeks later. When the license finally arrived, the exporter was forced by lack of available cargo space to divide his shipments into three separate lots, the last of which was not scheduled to get off the dock until six weeks after receipt of the license—or a total of 10 weeks from the time the order was received. Modification of export licensing regulations has been proposed to the extent of allowing license applicants to book cargo space upon approval by local customs officials with actual shipments to be dependent upon receipt of the actual license from Washington. Another burr which might be put under the saddle of licensing restrictions would be the establishment of more extensive and authoritative State department offices on the West Coast.

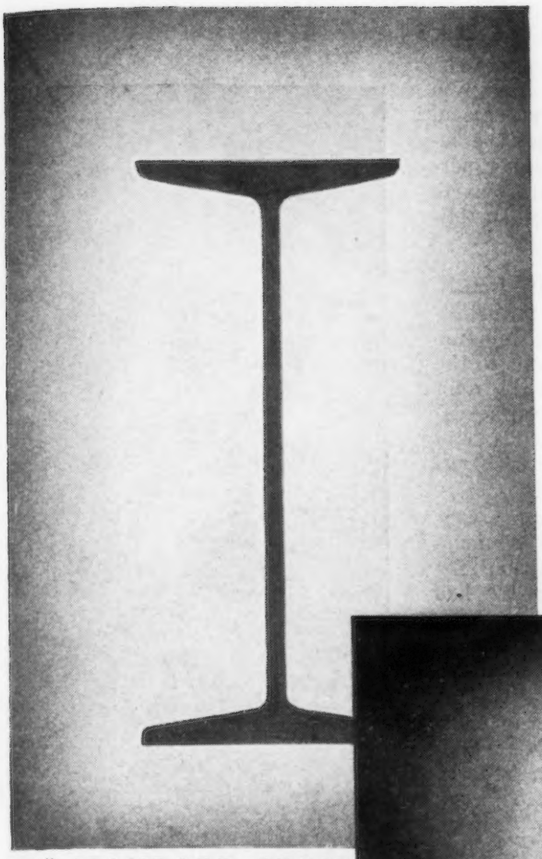
Members of AFL Machinists Union 68 of San Francisco who celebrated All Fools' Eve by striking against approximately 65 machine shops and foundries were still enjoying an enforced Easter vacation as this was written. The California Metal Trades Association, representing employers in negotiations, estimated that approximately $7,000,000 worth of defense orders were tied up. Approximately 1500 machinists struck, and between 4000 and 4500 additional workers refused to go through machinists' picket lines. The strike has boiled down to a wage dispute with a gap of two and a half cents per hour separating the employers' offer and union demands in the principle personnel category. Employers offered to give half the wage ground between the rate in effect preceding the strike and the original union demand; they offered to make final settlement retroactive to April 1; they conceded continued payment of double time for overtime work on Saturdays and Sundays; they offered to arbitrate wage questions; but Local 68 lived up to its reputation as a tough-shelled egg.

BACKWASH of the Ford Motor Co. strike was felt by the Ford assembly plant at Richmond, Cal., which was forced to shut down when components from the struck River Rouge plant were exhausted.

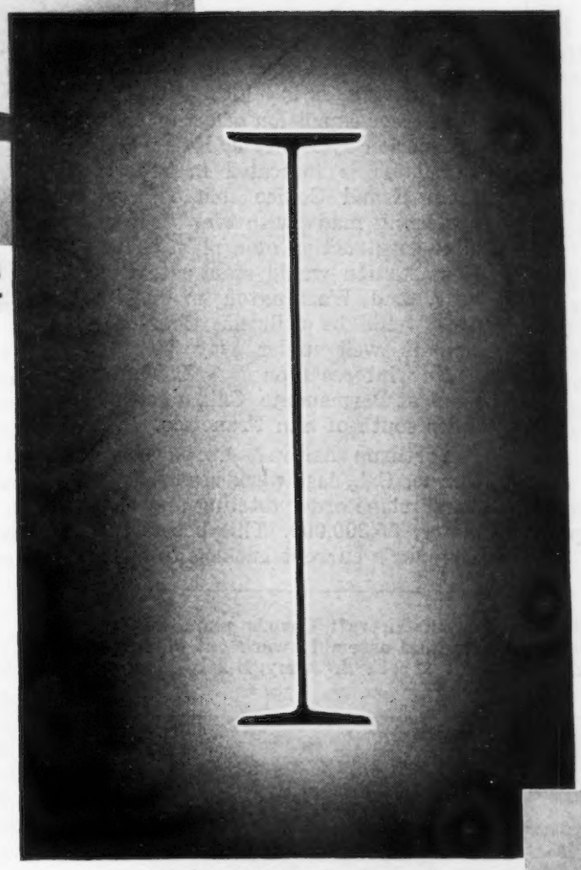
While labor peace at the Pittsburg, Cal., plant of Columbia Steel Corp., United States Steel Corp. subsidiary, hung on results of Carnegie-Illinois negotiations, the local SWOC union expelled an alleged Communist, and adopted strongly-worded resolutions condemning Nazism, Fascism and Communism and "deploring public conception that the CIO is Communist-dominated." No attempt was made to ape the unique action of Boeing Aircraft's Aeronautical Mechanics' Union which, after expelling an of-

CONTROLLED QUALITY
JUNIOR BEAMS

—strong, lightest-weight steel I-sections rolled—reduce dead weight as roof and floor members in many types of structures.



10″ STANDARD BEAM
25.4 POUNDS PER FOOT



10″ JUNIOR BEAM
9 POUNDS PER FOOT

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON & STEEL WORKS • PITTSBURGH, PENNSYLVANIA

ficial for Communistic activities, appropriately fined him $5,000.

Production line methods have been brought to X-ray laboratories at Lockheed Aircraft Corporation's Burbank, Cal., plant where a battery of four chrome-trimmed, fully automatic X-ray machines radiograph as high as 20,000 aluminum castings per 24-hr. day. With a capacity of more than 5000 parts per day, each X-ray machine is approximately 10 ft. high and 4 ft. square. The hood and conveyor table, which operates on a shuttle principle, are lined with 1800 lb. of lead to shield the operator completely from the high voltage X-rays.

The automatic machines are used principally on light alloy parts. Larger parts, odd sizes, bronze and steel parts, and weldings are handled in the regular X-ray room.

The new machines are operated by a robot control. When the electrical X-ray control is turned on, the cabinet is lowered in place and held there until the exposure has been made. It is then raised automatically and the conveyor table, which is synchronized with the X-ray mechanism, slides out from under the hood, and the new set-up of parts is pulled into place and radiographed. This continuous operation makes it possible to expose a negative a minute. Approximately 1000 14x17-in. X-ray negatives are handled daily. A two months' supply of film is kept on hand constantly in an air conditioned room, which is maintained at a temperature of about 42 deg. F.

X-ray inspection of aluminum castings has proved so successful that most new model planes are being designed to take a higher percentage of castings. All stress parts are subjected to X-ray examination.

NORTHWEST STEEL ROLLING MILL, Seattle, is installing a new electric steel melting furnace which will add 100 tons to the firm's operating capacity. No increase is being made in rolling capacity which will be adequate to handle the added tonage with the addition of a working shift.

Most coast rolling mills are concentrating on production of merchant bars, and competition for reinforcing steel business has dropped in consequence. Thus, the reinforcing steel market is firmer than in several years although no real shortage is in sight.

Further expansion of magnesium production by Henry J. Kaiser and associates is indicated in reports from Grand Coulee that surveys are being made with view to possible construction of a plant there. Construction would start late this year, and Washington magnesite ores would be utilized. Construction is well under way by the Kaiser interests on a $12,000,000 plant at Permanente, Cal., about 40 miles south of San Francisco.

Northrup Aircraft Corp., Hawthorne, Cal., last week received an Army plane order totaling approximately $5,300,000. This boosts the company's current backlog to $31,387,968 as compared with $2,500,000 a year ago. During March the company made deliveries of $732,771 as compared with $186,236 in January. In the comparable period last year the company was not yet in production.

Some indication of where the skilled workers needed for shipbuilding operations on the coast are coming from was given last week with a report from the gold mining regions of California that new mining operations have been reduced because of the uncertainty of the labor situation. In one small region alone it is estimated that approximately 500 experienced miners quit the gold fields to accept employment in defense industries at higher wages.

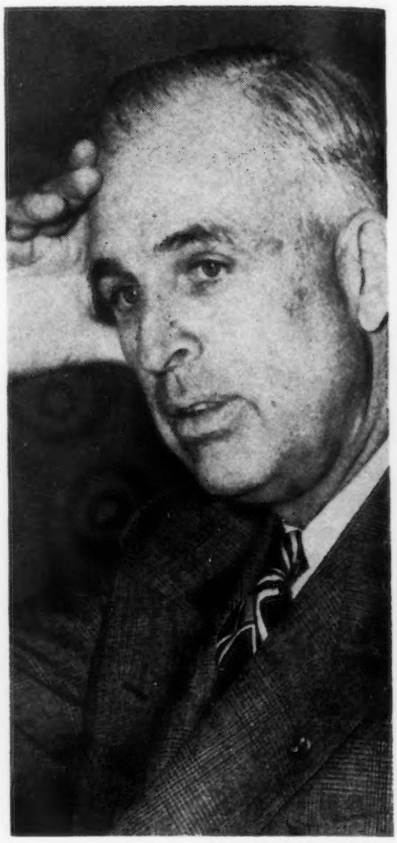


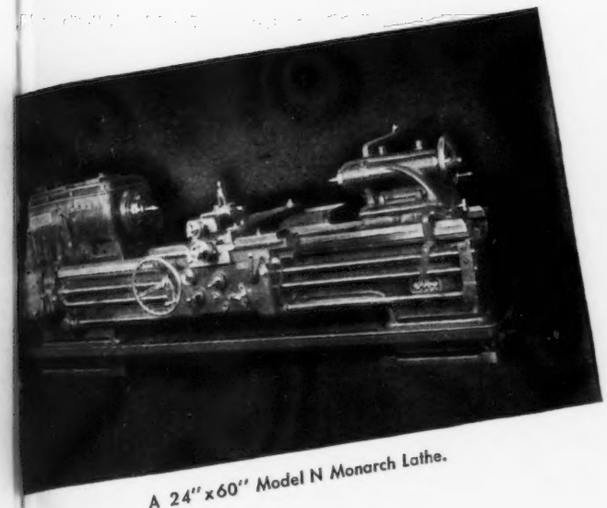
Photo only by International

IN ONE YEAR, the U. S. aviation industry has accomplished more than Germany was able to accomplish in five years, Merrill C. Meigs, OPM aircraft section chief, said last week at Los Angeles. Largest U. S. center of airplane (not engines) production is Los Angeles County.

COMPLETED OUT OF DOORS: Consolidated Aircraft Corp.'s plant at San Diego, Cal., completes 30 per cent of its final assembly work out of doors. The planes shown are principally Model 32 (U. S. Army B-24Q 4-engine bombers.

Photo by International

THIS IS NO TIME FOR A PATCH!



A 24"×60" Model N Monarch Lathe.

"PATCHED-UP" production lines are no answer to the needs of expanding markets. If industry is to produce, at a profit, the tremendous demands of tomorrow's America, it must equip now with high-production, efficient, profit-making machinery. The day of hand-to-mouth buying of machine tool equipment is over. Industry has learned its lesson—long range planning, not short-sighted "patching", is the only safe policy.

Monarch Lathes are the answer to stuttering production lines. In design, capacity, and performance, Monarch Lathes have been engineered to meet *tomorrow's* production requirements. Strengthen the weak links in your production line—plan now to replace worn-out, inefficient, obsolete equipment with modern Monarch Lathes. The Monarch Machine Tool Company, Sidney, Ohio.

MONARCH LATHES

Fatigue Cracks

BY A.H.DIX

Plastic Fixation

• • • Bill Sherman pointed out recently in "On the Assembly Line" that there is a great deal of loose talk about the use of plastics and other substitutes. If carried too far this can, of course, become an obsession. Just the other day we received an anonymous contribution postmarked Canal St. station, New York City, and addressed to "THE IRON AGE Experimental Laboratories," consisting of an ash clinker and a torn piece of cardboard inscribed:

> "Plastic—plasticity—or the evidence on the substitute for plaster of Paris casts—plastic surgery—quilt, comforter, frankfurters and a roll, oxygen, justice, assistance, amendment 8, section 12, New York State Constitution—oxygen tanks—plasticity keeps all together."

Take it away, Dr. Freud!

Euphemism

• • • *Every day we learn something new. Last week we had a visitor who told us he had a "double job." We congratulated him on his good fortune, and then he explained that as a matter of fact he had no job, as "double job" is slang for double hernia.*

Descending Scale

• • • This being *Honey for Breakfast Week*, as celebrated by the American Honey Institute and no one else that we know of, we take the liberty of quoting from a letter a Wright Field executive sent in—"I find your magazine technically excellent and generally good." The adjectival arrangement is anti-climactic, but we are grateful nevertheless.

The same executive says he is taking all of last year's issues and is binding them in two volumes, to make room on his shelves. If you want to bind your copies at any time, let us know and we will give you the name of a bookbinder who will do the job at a surprisingly low price.

Anatomical Notes

• • • Gus Kanin's place on West 39th St., between Sixth Ave. and Broadway, has a big sign reading "Felt Bodies." And we see from the Government Awards section that a lot of orders are being given out for buoy bodies.

Torsional Torture

• • • The year's most tortuous pun so far appears in an advertisement of "Stribar" hot rolled steel strip we saw in an English contemporary. The headline is *"Oliver Twists but Stribar Coils."* Shame!

Oozed Out

> Speaking of picturesque speech, I met a fellow on the train the other day who turned out to be an editor of a motion picture magazine. In commenting on the shortcomings of college men as writers, he said: "I don't know how they ever got through college. They must have been graduated by extrusion."
>
> —*Deac*

He Gives Us a Dead Anneal

• • • You can pick your teeth at the table; you can wear a green tie with a blue shirt; you can ask politely if her little boy is slightly cockeyed; you can even burn a hole in her broadloom, but you're safe in the affections of a lady who is approaching the saftig side if you tell her she is looking anemic.

And if you want to soften up a publisher the quickest way is to make offhand comments pointing to a belief that reader interest in his publication is as hot as a tin roof on Main St., Natchez, Miss., at high noon in July.

W. C. Baker of Altus, Okla., has the idea. He brings us down to 110 Brinell by remarking:

> "Mar. 13 issue, page 95, Government Awards. Blackhawk Mfg. Co. received an order for jack assys. Which goes to show that we even read the small print."

Flatterer

• • • E. V. Gammill, of the J. A. Werme Steel & Iron Works, Oklahoma City, Okla., who went through the Apr. 3 problem as fast as measles goes through the eighth grade, writes:

> Now, don't be jealous, but we always look for the "Bull of the Woods" first, Mr. Van Deventer's editorial second, "Fatigue Cracks" third; then we get down to business.

Instead of gnawing our finger nails to the elbow, we're grinning from ear to ear over being included in such fast company.

Knights of the Nifty Phrase

• • • Steve Wright, your favorite family journal's managing editor, red pencils this paragraph in *The Detroit Purchaser*, official publication of the Purchasing Agents Association of Detroit:

> ". . . the chief phoned for J. B. (our purchasing agent) to come to his office pronto. He came back in about 20 min. . . . The muscles of his face were bulging. It seems that one of those Blab advisory service sheets had found its way to the Chief's desk. It stated that **there'd be no shortage in nonferrous metals.**"

The writers of some of the weekly confidential letters deserve a lot of credit for courage. They have to make dogmatic pronouncements on subjects on which their information is as scanty as a $12 pantie. But with typewriter in one hand and ouija board in the other they bravely make one deep sea dive after another, and emerge with an occasional pearl.

To bring the metaphor to dry land, they dig up their gems with little spadework, whereas our large market-reporting staff has to turn over the ground patiently and laboriously each week in search of facts that will illuminate the situation for you. We are awed by their cavalier treatment of complex situations and envious of their carefree handling of problems that puzzle authorities.

Routed as the Crab Flies

• • • The week before last we spoke of a man going from Cleveland to Pittsburgh by way of Toledo. As Pittsburgh is southeast of Cleveland and Toledo is west, the route we laid out is that of a taxi driver trying to run up a big fare on a stranger in town. Pat Dwyer, engineering editor of *The Foundry*, diagrams the route for us and says, "Wrong-way Corrigan could do it!"

Our excuse is that we were in Detroit when we wrote the item. We had spent the day in the Motor City's new industrial area which lies out Hoover Road way and the Hollywood atmosphere of the new plants there had bemused us. They are all built of yellow brick, with curved fronts. Glass brick is as common as corn cobs at a Greenpoint clambake. And the interiors are wonderful to behold. Every time we asked for a name we expected to see Clark Gable pop out. We will probably get used to it in time.

Puzzles

Last week's carpet is 6.705 ft. long.

If you can do this in your head in five seconds, help yourself to a PBK key on the way out:

> *Suppose you place a quarter on the table and hold it fixed and then revolve another quarter around it. How many revolutions does the second quarter make in completely encircling the first quarter once?*

Nickel Steels Are Placed Under Strict Priority Control

News of Industry

• • • **All nickel bearing steels** were placed under strict priority control on April 11 by order of E. R. Stettinius, Jr., Director of Priorities. The tight situation in nickel is responsible for this action, which applies equally to mills and warehouses.

Defense orders are to be filled ahead of civilian and non-defense orders. Defense orders, including British orders, will automatically take a preference rating of A-10, unless higher ratings are specifically assigned, thus coming ahead of orders with lower ratings or no ratings.

A specific schedule of preference ratings is set forth. These range from A to B-8. Producers and distributers are asked to fit customers' orders into these classifications, thus avoiding the necessity for individual preference ratings, although such may be issued by the Division of Priorities in special instances.

Users of nickel steels whose ratings fall between B-4 and B-8, inclusive, may receive only certain percentages of their average 1940 monthly shipments for corresponding purposes. These percentages range from 70 per cent for B-4 to 10 per cent for B-8, depending on the importance of the need.

Producers of nickel steel may make shipments to all classes of customers down to those in group B-8, but warehouse distributers may not, until further notice, fill orders in classes below B-3. This provision was adopted because of the necessity of conserving warehouse stocks for defense purposes.

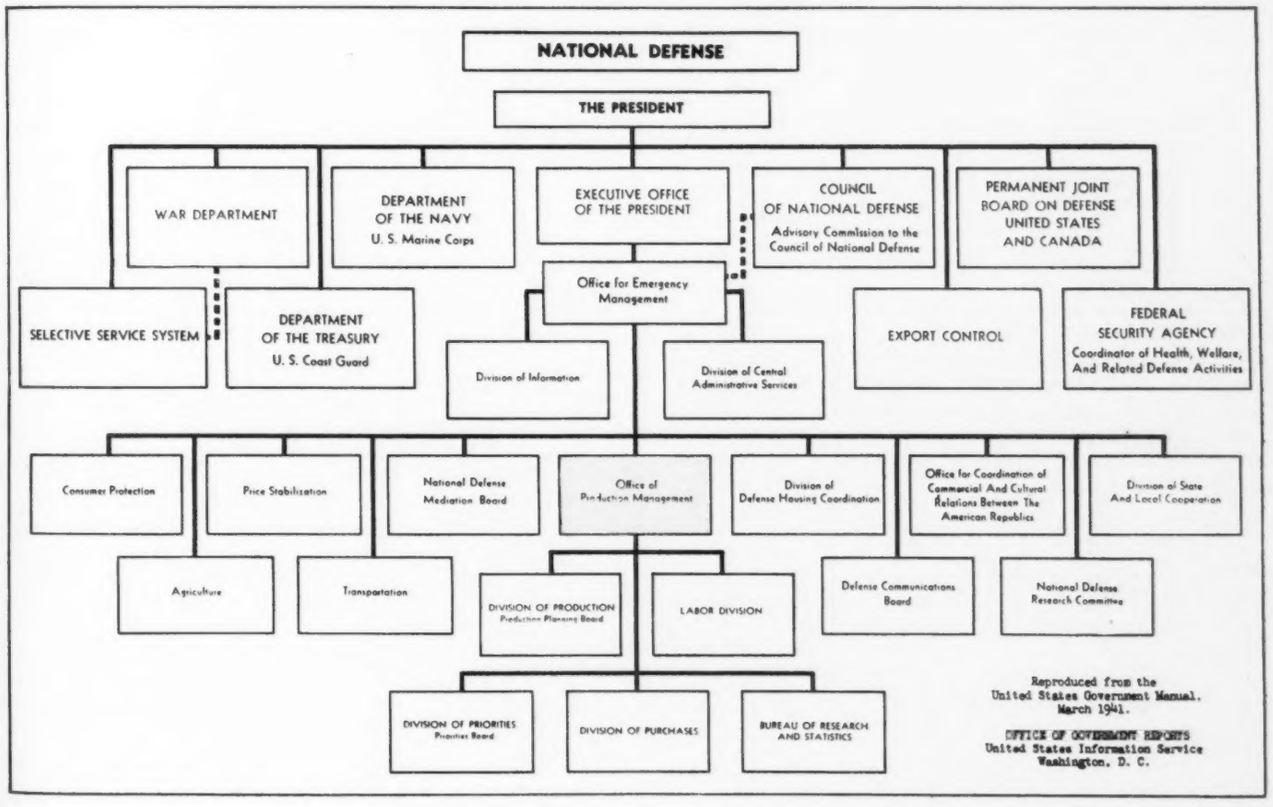
Beginning in May, producers of nickel bearing steel may ship to distributers in quantities which, on the average, are equal to their monthly shipments during the first four months of this year. Inventories of nickel steel held by customers of producers and distributers are to be kept to an amount not generally in excess of 30 days' supply. All producers and distributers are required to keep accurate records of inventories, shipments, orders and operations.

The preference rating schedule set forth in the order follows:

A Preference ratings of A-1 to A-10, inclusive, are assigned to defense orders . . . and to all other orders to which a preference rating in the A classification has been or may hereafter be assigned by the Director of Priorities.

BB Preference rating BB is hereby reserved for emergency as-

ALMOST HIDDEN in this new organization chart for U. S. defense is the Office of Production Management. All people in industry, and much of the general public, knowing that modern wars are decided by highly organized industries would have given the OPM a somewhat more important place in this chart, which appears in the U. S. Government Manual for March, 1941. (To assist IRON AGE readers the OPM box appears in color).



signment by the Director of Priorities to provide for special cases of immediate urgency.

B-1 Preference rating B-1 is hereby assigned to orders (a) for the manufacture of parts for the repair or replacement of existing apparatus, equipment, and devices and (b) for the manufacture of new apparatus, equipment, and devices, in either case under (a) or (b) used directly or indirectly in connection with the manufacture of material which enters in substantial quantity into the fulfillment of defense orders, although such orders may not bear specific preference ratings.

B-2 Preference rating B-2 is hereby assigned to orders for the manufacture of parts for the repair or replacement of existing apparatus, equipment, and devices which must continue to operate in order to preserve essential production and services.

B-3 Preference rating B-3 is hereby assigned to orders for new apparatus, equipment, and devices used directly in operations which must continue in order to preserve essential production and services.

B-4 Preference rating B-4 is hereby assigned to orders for products essential to the protection of public health or safety.

B-5 Preference rating B-5 is hereby assigned to orders for customers of each producer or distributer, to whom shipments have been made during 1940 by such producer or distributer, requiring less than a total of one ton of nickel bearing steel per month. This rating is temporarily assigned pending further investigation.

B-6 Preference rating B-6 is hereby assigned to orders for customers whose use of nickel bearing steel does not exceed 2 lb. per $100 of final sales value of the article or articles produced by such customers, of which it is an essential component.

B-7 Preference rating B-7 is hereby assigned to orders for the material used in products in which no reasonably satisfactory substitute for nickel bearing steel is available.

B-8 Preference rating B-8 is hereby temporarily assigned, until such time as a substitution shall be effected, to orders for the material used in products in which a reasonably satisfactory substitute for nickel bearing steel is available or can be made available. Deliveries by any producer on orders with preference ratings from B-4 to B-8, inclusive, may not exceed the following percentages of the customers' monthly average of 1940 shipments from the same producer for corresponding purposes: B-4, 70 per cent; B-5, 50 per cent; B-6, 40 per cent; B-7, 30 per cent; B-8, 10 per cent.

Customers who use nickel steel for two or more different types of products bearing different preference ratings, however, shall have their orders for each type treated separately.

As defined in the order, nickel bearing steel is steel in which the nickel content is 0.40 per cent or more, or any steel containing less than 0.40 per cent if nickel has been specified by the customer or is known to have been added to obtain a desired physical quality in the steel.

The order also provides that preference ratings in the B class, above B-8, shall not apply to customers who can readily use substitutes for nickel steel.

CIO Aluminum Union Seeks Pay Advance

Pittsburgh

• • • Leaders of the CIO Aluminum Workers of America have requested a meeting May 1 with Aluminum Co. of America to discuss wage increases for 20,000 employees. A contract between the union and company will not expire until Nov. 1.

(This is one of the vital U. S. defense companies. Mandatory priorities were invoked for aluminum on Feb. 28 and the Aluminum company's output is being used for airplane and other defense needs).

Coming Events

April 16 to 18—Electrochemical Society, Inc., spring meeting, Cleveland.

April 23 to 25—Concrete Reinforcing Steel Institute, annual meeting, Hot Springs, Va.

April 23 to 25—Open Hearth and Blast Furnace Committees, American Institute of Mining and Metallurgical Engineers, annual meeting, Chicago.

April 28—Association of Iron and Steel Engineers, annual spring conference, Youngstown.

April 28 to 29—American Zinc Institute, annual meeting, St. Louis.

May 1 to 2—The Galvanizers Committee, annual spring meeting, Pittsburgh.

May 8 to 9—National Metal Trades Association, annual convention, Chicago.

Allegheny Ludlum Lifts Tungsten Steel Royalty

• • • To aid in conserving the nation's strategically important supply of tungsten, the Allegheny Ludlum Steel Corp., Pittsburgh, has lifted royalty restrictions on manufacture of tools from its DBL low-tungsten, high speed tool steel.

WHAT THIS PHOTO of the newest American battleship, North Carolina DOES NOT show to U. S. enemies far outweighs in interest what it SHOWS. The distribution and weight of its armor is only one of scores of naval construction secrets hidden by the shining hull of this 35,000-ton vessel, first to be commissioned in this country since 1918.

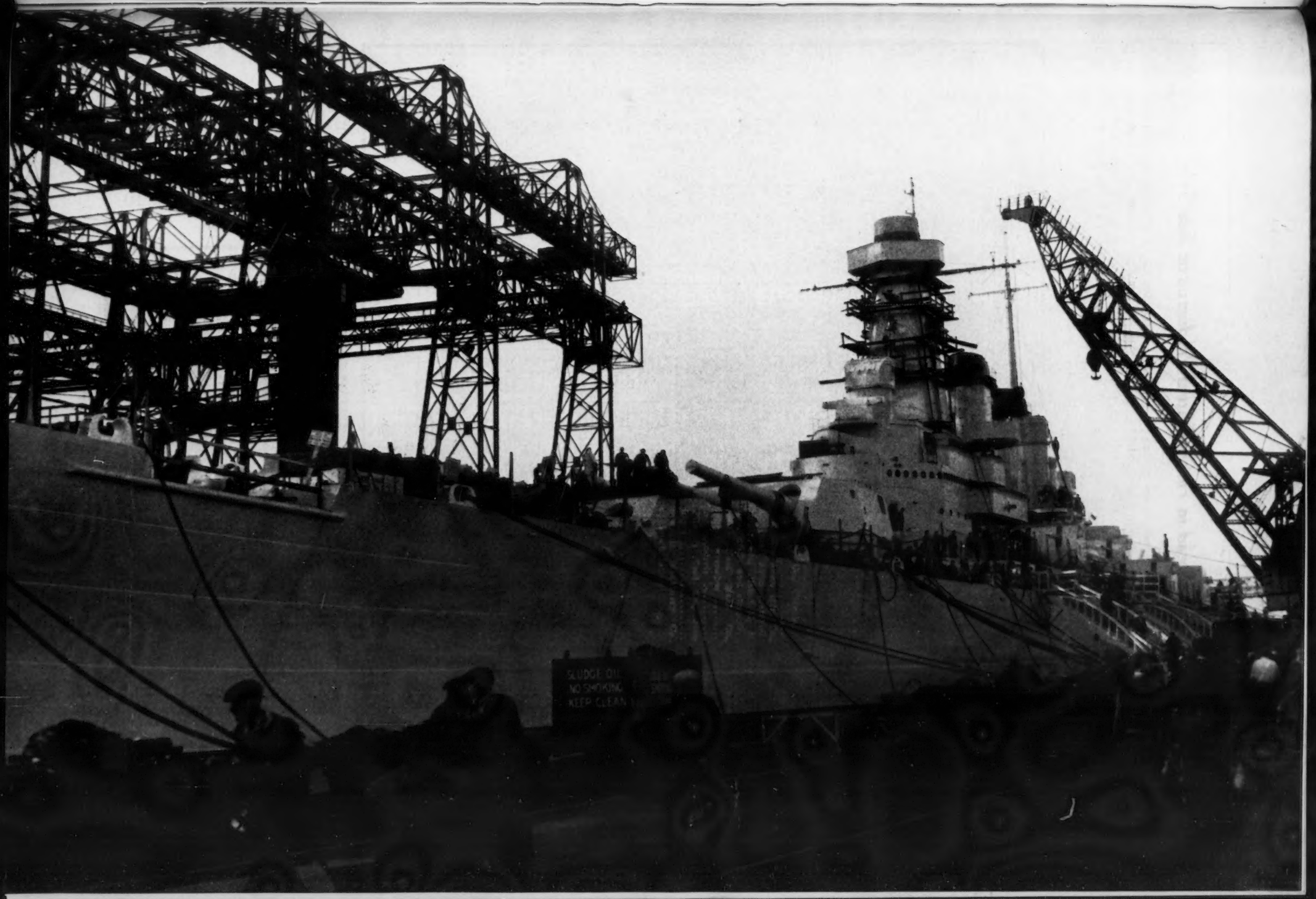
Photo only by Harris-Ewing

DBL is a patented molybdenum high speed steel containing less than one-third the amount of tungsten contained in ordinary 18-4-1 high speed steels. This step is expected to reduce the present consumption of tungsten by high speed steel users, chief market of the vital metal.

New Navy Ammunition Depot for Indiana

Burns City, Ind.

• • • More than 300 acres, comprising 16 farms, will be purchased here for the site of a new Navy ammunition depot. To speed land transfers, Federal court "declarations of taking" will be used instead of options. Amounts to be paid farmers for their land will include cost of moving and loss of income caused by inability to raise crops this year. The Farm Security Administration will open an office to aid dispossessed farmers.


SLUDGE OIL
NO SMOKING
KEEP CLEAN

Sheets in the Lead in Finished Steel Products For Sale

Of all of the major steel products, sheets were far out in front in both January and February, according to the monthly report of the American Iron and Steel Institute on semi-finished and finished steel produced for sale. In February the production of sheets, totaling 1,093,293 net tons, was 107.3 per cent of rated capacity, while the January output, totaling 1,136,788 tons, was 101 per cent of capacity. In the first two months of the year the total output of sheets, at 2,223,919 tons, comprised more than 22 per cent of all steel produced for sale. Output of semi-finished and finished steel produced for sale was 4,864,936 tons.

AMERICAN IRON AND STEEL INSTITUTE
Capacity and Production for Sale of Iron and Steel Products

February - 1941
PERIOD

		Number of companies	Items	* Annual Capacity Net tons	Production for Sale—Net Tons: Current Month: Total	Current Month: Per cent of capacity	Current Month: Shipments: Export	Current Month: Shipments: To members of the industry for conversion into further finished products	Year to Date: Total	Year to Date: Per Cent of capacity	Year to Date: Shipments: Export	Year to Date: Shipments: To members of the industry for conversion into further finished products
Steel Products	Ingots, blooms, billets, slabs, sheet bars, etc.	31	1	xxxxxxx	544,933	xxx	213,088	121,159	1,121,429	xxx	434,041	248,574
	Heavy structural shapes	8	2	5,175,800	321,950	81.1	19,211	xxxxxxx	691,131	82.6	44,966	xxxxxxx
	Steel piling	4	3	360,000	18,125	65.6	1,648	xxxxxxx	40,178	69.0	2,845	xxxxxxx
	Plates—Sheared and Universal	19	4	6,179,470	417,637	88.1	39,977	2,023	859,718	86.0	84,600	4,475
	Skelp	7	5	xxxxxxx	73,517	xxx	10,369	32,950	152,516	xxx	18,246	71,592
	Rails—Standard (over 60 lbs.)	4	6	3,613,600	137,380	49.6	4,940	xxxxxxx	273,330	46.8	17,494	xxxxxxx
	Light (60 lbs. and under)	6	7	302,800	15,310	65.9	6,347	xxxxxxx	32,243	67.3	13,073	xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	102,000	1,222	15.6	767	xxxxxxx	3,679	22.3	925	xxxxxxx
	Splice bar and tie plates	15	9	1,300,200	61,593	61.7	672	xxxxxxx	111,376	53.0	3,622	xxxxxxx
	Bars—Merchant	34	10	xxxxxxx	503,565	xxx	66,877	48,268	1,074,730	xxx	130,986	106,848
	Concrete reinforcing—New billet	15	11	xxxxxxx	103,747	xxx	18,797	xxxxxxx	212,352	xxx	38,579	xxxxxxx
	Rerolling	17	12	xxxxxxx	9,394	xxx	682	xxxxxxx	18,454	xxx	1,356	xxxxxxx
	Cold finished—Carbon	19	13	xxxxxxx	91,395	xxx	2,070	xxxxxxx	184,776	xxx	3,915	xxxxxxx
	Alloy—Hot rolled	15	14	xxxxxxx	121,503	xxx	12,158	12,641	249,525	xxx	28,149	24,422
	Cold finished	15	15	xxxxxxx	13,354	xxx	1,916	xxxxxxx	25,886	xxx	3,412	xxxxxxx
	Hoops and baling bands	4	16	xxxxxxx	7,035	xxx	215	xxxxxxx	14,125	xxx	348	xxxxxxx
	TOTAL BARS	52	17	12,678,085	850,043	87.4	102,715	60,909	1,779,848	86.8	206,745	131,270
	Tool steel bars (rolled and forged)	15	18	127,870	8,563	87.3	842	xxxxxxx	16,655	80.6	1,731	xxxxxxx
	Pipe and tube—B. W.	13	19	2,047,200	115,604	73.6	11,139	xxxxxxx	248,991	75.2	15,322	xxxxxxx
	L. W.	9	20	1,080,260	35,092	42.3	1,131	xxxxxxx	75,542	43.3	2,553	xxxxxxx
	Electric weld	5	21	692,520	29,845	56.2	711	xxxxxxx	54,442	48.6	1,023	xxxxxxx
	Seamless	15	22	3,119,190	155,115	64.8	23,906	xxxxxxx	314,518	62.4	31,746	xxxxxxx
	Conduit	6	23	152,145	10,058	86.2	138	xxxxxxx	21,298	86.6	189	xxxxxxx
	Mechanical Tubing	13	24	538,975	38,087	92.1	5,619	xxxxxxx	77,588	89.0	9,508	xxxxxxx
	Wire rods	18	25	xxxxxxx	119,620	xxx	12,867	19,404	249,903	xxx	29,574	42,526
	Wire—Drawn	36	26	2,299,340	161,245	91.4	12,510	1,908	340,194	91.5	24,917	3,856
	Nails and staples	19	27	1,137,090	65,836	75.5	5,580	xxxxxxx	135,909	73.9	9,366	xxxxxxx
	Barbed and twisted	16	28	448,770	22,449	65.2	5,904	xxxxxxx	45,852	63.2	9,836	xxxxxxx
	Woven wire fence	15	29	786,790	25,758	42.7	176	xxxxxxx	52,335	41.1	695	xxxxxxx
	Bale ties	11	30	124,450	4,542	47.6	6	xxxxxxx	8,729	43.4	36	xxxxxxx
	All other wire products	5	31	27,030	406	19.6	-	xxxxxxx	894	20.5	-	xxxxxxx
	Fence posts	14	32	147,645	5,649	49.9	120	xxxxxxx	11,957	50.1	215	xxxxxxx
	Black plate	11	33	560,455	29,449	68.5	974	7	55,264	61.0	1,870	8
	Tin plate—Hot rolled	7	34	866,120	18,948	28.5	5,140	xxxxxxx	39,677	28.3	5,534	xxxxxxx
	Cold reduced	10	35	2,995,300	186,082	81.0	12,187	xxxxxxx	374,520	77.3	28,580	xxxxxxx
	Sheets—Hot rolled	23	36	xxxxxxx	607,016	xxx	29,976	19,523	1,243,494	xxx	60,662	34,377
	Galvanized	14	37	xxxxxxx	145,815	xxx	13,260	xxxxxxx	299,303	xxx	23,186	xxxxxxx
	Cold rolled	15	38	xxxxxxx	274,676	xxx	5,156	xxxxxxx	547,455	xxx	12,056	xxxxxxx
	All other	13	39	xxxxxxx	65,786	xxx	2,181	xxxxxxx	133,667	xxx	3,957	xxxxxxx
	TOTAL SHEETS	26	40	13,280,970	1,093,293	107.3	50,573	19,523	2,223,919	103.6	99,861	34,377
	Strip—Hot rolled	23	41	3,522,980	158,852	58.8	8,549	19,980	332,408	58.4	15,372	42,173
	Cold rolled	34	42	1,371,560	91,121	86.6	1,761	xxxxxxx	185,784	83.8	2,812	xxxxxxx
	Wheels (car, rolled steel)	5	43	422,825	20,526	63.3	11	xxxxxxx	40,338	59.0	145	xxxxxxx
	Axles	4	44	472,280	12,618	34.8	2	xxxxxxx	27,335	35.8	10	xxxxxxx
	Track spikes	11	45	327,275	13,521	53.8	166	xxxxxxx	26,156	49.4	480	xxxxxxx
	All other	3	46	9,100	947	135.7	289	xxxxxxx	1,998	135.8	301	xxxxxxx
	TOTAL STEEL PRODUCTS	131	47	xxxxxxx	4,864,936	xxx	560,035	277,863	10,028,354	xxx	1,118,233	578,851
	Pig iron, ferro manganese and spiegel	24	48	xxxxxxx	602,968	xxx	44,296	180,312	1,266,636	xxx	90,623	391,080
	Ingot moulds	4	49	xxxxxxx	57,388	xxx	57	xxxxxxx	116,095	xxx	85	xxxxxxx
Iron Products	Bars	9	50	109,195	4,781	57.1	-	339	9,101	51.5	1	588
	Pipe and tubes	3	51	109,300	4,981	59.4	14	xxxxxxx	10,006	56.6	70	xxxxxxx
	All other	2	52	71,000	1,343	24.7	4	-	3,474	30.3	607	-
	TOTAL IRON PRODUCTS (ITEMS 50 to 52)	11	53	224,995	11,105	64.3	18	339	22,581	62.1	678	588

* To be revised.

Total number of companies included - 148

The estimated average yield of products for sale from ingots produced by the companies included above is 71.2%, which applied to their total ingot capacity equals 57,533,200 net tons of finished rolled products.

Production for sale, less shipments to members of the industry for further conversion, related to the estimated yield is as follows:

Current month 4,587,073 N.T.; 103.9%
Year to date 9,449,503 N.T.; 101.6%

Photo only by Harris-Ewing

THE MAN TO WATCH: During the next few months, as industry strains to convert its great mass production lines to war materials and equipment, "a man to watch" is Philip Murray, above, head of the CIO and SWOC. While Murray is a principal in most current employer-employee disputes, he is also a member of the 11-man National Defense Mediation Board. Conspicuously "unrepresented" on this board is a long list of industries such as steel, automobile, aviation, shipbuilding, machine tool.

Tungsten Ore Deposit Found

Washington

• • • **Engineers in the** Bureau of Mines and geologists of the Geological Survey report the discovery of a high-grade deposit of tungsten ore in Valley County, Idaho.

Illinois AFL Claims No Strike Has Held Up Defense

Chicago

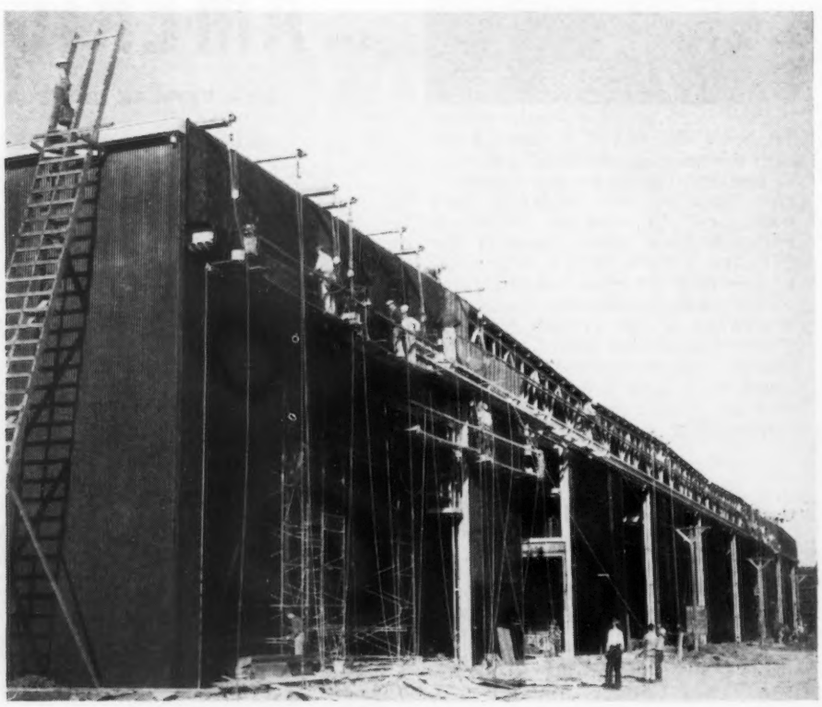
• • • **"Strikes should be resorted** to only after all other means of obtaining adjustment have been thoroughly tried and have failed." This was the recommendation of the executive board of the Illinois State Federation of Labor to all its AFL unions in the state. Labor was urged to put defense first and to lay aside its weapon of strikes, even in the presence of disputes, leaving settlement of such arguments to its leaders through mediation.

The board surveyed nearly 3000 local AFL unions throughout the state and reported that not a single case of retarding defense production by AFL strikes existed in Illinois. Victor A. Olander, secretary-treasurer, of the board, wired Hatton W. Sumners, chairman of the House judiciary committee that: "There are a number of instances in which the men are being constantly irritated by the unfortunate attitudes of anti-union corporations which resort to many subterfuges to avoid dealing with unions. But our men are remaining at work while we seek to secure justice for them through the various governmental agencies which have been established to deal with such matters."

Lukens Shop Strike Ended

• • • **Under an agreement** reached between Thomas F. Neblett, federal commissioner of conciliation and C. L. Huston, Jr., director of personnel relations of Lukens Steel Co., the machine shop employees of Lukens Steel have returned to work. The agreement: The machine shop employees returned to their jobs before any negotiations were resumed; upon return of the men to work the company would continue negotiations on general and particular wage matters; the company is to go along with the steel industry generally on general wages and make any adjustments retroactive to April 1, and would do the same for particular wage adjustments; the union agreed to have no further work stoppage during the life of its contract with Lukens and its subsidiaries.

AMONG FIRST OF the "Blackout" defense plants on this continent is this new Douglas Aircraft Co. factory at Long Beach, Cal. The raw stock and storage unit shown here is one of 12 buildings (colored to blend into the landscape, fireproof, windowless, air-conditioned, and with subterranean vaults to safeguard essential materials).



Plane Plant Schedule Shortened 45 Days

Dallas, Tex.

• • • **Use of bomb-resisting insulated structural units enabled contractors to lay an acre of roof a day and position walling at the rate of one-third of an acre daily on the new North American Aviation Corp. $7,000,000 assembly plant here. Actually, 45 days were cut off construction schedule and plant was scheduled to open in mid-April as the result. Earlier completion of building means approximately 375 extra bomber training planes since the plant is set up to turn out 250 bombers monthly.**

Double Pay, No Vacations For Caterpillar Tractor

Peoria, Ill.

• • • **"Double pay—but no** vacations" is the way Caterpillar Tractor Co. and employes are answering the defense call in 1941. On Aug. 1 special vacation checks will be issued equal to regular pay for time worked. Eliminating of vacation shutdown was decided on to increase defense production despite the fact that Caterpillar's payroll is at an all-time high.

Hoosier Ordnance Works Will Employ 6500

Charlestown, Ind.

• • • **When the Hoosier** ordnance works is completed here, about 6500 semi-skilled men and women will be employed, of which about 40 per cent will be female sewing machine operators. The gunpowder bag-loading plant will be operated by Goodyear Engineering Corp.

Fairbanks, Morse & Co. Distributes 3.41% Bonus

Beloit, Wis.

• • • **Employees of Fairbanks,** Morse & Co., received a total of $217,818 in bonuses payable to all on the payroll continuously since since Jan. 1, 1940. The amount represented 3.41 per cent of 1940's wage payments. This compared to a 1939 bonus equalling 2.74 per cent.

Firth Sterling Lifts Wages Of 950 By 10c. An Hour

McKeesport, Pa.

• • • **Firth Sterling Steel Co.** here has raised the base wage rate of 950 hourly tonnage and piece workers from 62½c. an hour to 72½c. In addition to this latest 10c. an hour raise, these employees are benefiting from a temporary 5 per cent bonus which was granted in February. The latter is to extend for a month or two, at which time the company will decide whether it will be continued.

According to L. Gerald Firth, president, the increase was a voluntary one, as the company had received no request from the employees. The company manufactures high speed tool, metal cutting and tungsten carbide steel.

Coal Stoker Output Hit By Defense Work

Harvey, Ill.

• • • **Defense business has forced Whiting Corp. here to discontinue production of domestic and industrial coal stokers. Manufacture of these items has been turned over to the Eddy Stoker Corp., Chicago. The newly formed Whiting Stoker Co. will act as sales agent for the stokers made by Eddy.**

Training Brochure On Contour Sawing Issued

• • • **Directed especially** to trade and vocational schools, training centers and NYA shop schools, a new spiral bound brochure has recently been published by Continental Machines, Inc., Minneapolis, describing and illustrating various applications of its Doall contour sawing and filing machines. Data on saws and files are given, as well as descriptions of accessory equipment and specification sheets on the various machines manufactured by the company. A sampling of letters from users is included.

Workers Waive Vacation, Will Work on Defense

Pittsburgh

• • • **Following action** at a recent SWOC lodge meeting, employees of the Heppenstall Co. agreed to waive vacations this summer in the interest of national defense. The employees will get the vacation pay in lieu of time off.

Steel Workers "Adopt" Two British Children

San Francisco

• • • **Workers in the** sorting mill on the Pittsburg, Cal., plant of Columbia Steel Co. have "adopted" two children in Great Britain since the first of the year. Eight men and eight women employees are sending checks for a year which will provide for the care of two children in England.

Built by

COMBUSTION ENGINEERING COMPANY, INC.

. . . this C-E Steam Generator; (Type VUZ; capacity—40,000 lbs. of steam per hr.; design pressure — 600 lbs. per sq. in.; total steam pressure—700F.) . . . one of two units . . .

using

WORTH

sheared

STEEL PLATES

and HEADS

REPRESENTATIVES • New York, N. Y., Wm. C. Dickey • Pittsburgh, Pa., McKee-Oliver, Inc. • St. Louis, Mo., Hubbell & Co. • San Francisco, Calif., W. S. Hanford • Seattle, Washington, Barde Steel Co. • Houston, Texas, The Corbett-Wallace Corp. • Cleveland, Ohio, E. F. Bond • Detroit, Mich., H. L. Sevin • Portland, Oregon, Barde Steel Co. • Los Angeles, Calif., Ducommun Metals & Supply Co. • Montreal and Toronto, Canada, Drummond, McCall & Co., Ltd.

Worth Steel Company
CLAYMONT, DELAWARE

Order Completed For 375 M.P.H. "Lancer" Pursuit Ships

• • • **Completion** of deliveries against a U. S. Army Air Corps contract for an unspecified number of YP-43 "Lancer" pursuit airplanes is announced by Republic Aviation Corp., Farmingdale, N. Y., through W. Wallace Kellett, president. Kellett said the lot of high-altitude pursuit interceptors had been accepted by the Army and that certain of the planes were now undergoing accelerated service testing at Patterson Field, Ohio. Air Corps pilots are flying the "Lancers" in relays, in order to give them hundreds of hours of rigorous testing in the minimum amount of time.

The YP-43 is powered with a Pratt and Whitney 1200 hp. air-cooled engine, which is supercharged for efficiency at higher altitudes. The plane weighs 6900 lb. fully loaded, has a wing span of 36 ft. and is 27 ft. 10 in. long. It carries both 30 and 50 cal. machine guns and fragmentation bombs. Speed is estimated at 375 mph.

Mine Safety Appliance Co. To Expand For Defense

Pittsburgh

• • • **Mine Safety Appliance Co.** will soon expand its activities following the acquisition of land and buildings at Callery, Butler County, Pa. The latter village is located between Mars and Evans City, Pa., and the property purchased was formerly owned by the National Fireworks Co. It is understood the expansion will take care of emergency, national defense production. Mine Safety has substantial government business at its plant here.

Work Starts On New Pratt & Whitney Addition

• • • **Work was started** April 3 on construction of a new factory addition to the Pratt & Whitney Aircraft Division of United Aircraft Corp. in East Hartford, Conn. The new addition will cover approximately 500,000 sq. ft. and will bring Pratt & Whitney's total floor area to more than 2,000,000 sq. ft. It is expected to be finished early in August. The general contractor is the Turner Construction Co.

MOLYBDENUM, TANTALUM, stainless steel and nickel scrap are being identified and separated at the Westinghouse Lamp Division, Bloomfield, N. J., by characteristic color tinges appearing on the different metals under daylight fluorescent lighting. An additional $100 of tantalum was recently recovered through fluorescent lighting from $700 of salvaged molybdenum.

C-I Gets Options On Site Near Duquesne Plant

Pittsburgh

• • • **For the purpose of "future** expansion," Carnegie-Illinois Steel Corp. is obtaining options on 38 acres of property located between the company's Duquesne steel works and merchant mill. The area is thickly populated and the suggestion had been made by civil officials that the property be taken over for a defense housing site. Use for such purpose would separate the two Duquesne plants of Carnegie-Illinois.

Westinghouse Unfilled Orders Total $285 Millions

Pittsburgh

• • • **Westinghouse Electric &** Mfg. Co.'s unfilled orders, of which 70 per cent are connected with national defense, amounted to $285,000,000 on March 31, according to George H. Bucher, president. He also said total employees exceeds 65,000, a new high record compared with 51,000 a year ago.

Government Awards

Government awards, during the week ended April 5, 1941, as listed by the Public Contracts Division, Department of Labor, follow:

Iron and Steel Products....$17,835,257

Air Cruisers, Inc., Clifton, N. J.; cylinder assy.; oxygen $10,680
Alan Wood Steel Co., Conshohocken, Pa.; steel 430,760
Allegheny Ludlum Steel Corp., Watervliet, N. Y.; steel rods 225,246
American Chain & Cable Co., Reading-Pratt & Cady Div., Reading, Pa.; valves 18,450
American Steel & Wire Co. of N. J., Washington; steel bars .. 88,591
Anchor Post Fence Co. of Calif., San Francisco; chain link fence; gates; posts 16,763
Armco International Corp., Middletown, Ohio; galvanized corrugated roofing 33,103
E. B. Badger & Sons Co., Boston; flexible expansion joints 32,730
Baldt Anchor, Chain & Forge Co., Chester, Pa.; chain; links; shots 371,692
chains and fittings 30,383
anchor chain 63,876
Berkley Machine Works & Foundry Co., Inc., Norfolk, Va.; stuffing tubes 39,762
Bethlehem Steel Co., Bethlehem, Pa.; bar steel 1,188,422
Bethlehem Steel Co., Seattle, Wash.; reinforcing bars 15,400
Buffalo Bolt Co., North Tonawanda, N. Y.; bolts; nuts 10,864
Camden Forge Co., Camden, N. J.; steel forgings 34,149
Capitol Steel & Iron Co., Oklahoma City; reinforcement bars. 66,385
Carnegie-Illinois Steel Corp., Washington; steel, I-beams, angles, etc. 1,520,647
Chapman Valve Mfg. Co., Indian Orchard, Mass.; gate valves .. 19,975
R. D. Cole Mfg. Co., Newnan, Ga.; steel tank and tower 67,380
Crane Co., San Diego, Cal.; plumbing material 13,509
Crane Co., Portland, Me.; ground key cocks 11,150
Crane Co., Long Island City, N. Y.; valves 53,794
Crucible Steel Co. of America, New York; pearlitic manganese 21,067
tool steel 10,879
Richard S. Danforth, Berkeley, Cal.; anchors 21,350
Dixie Culvert & Metal Co., Atlanta, Ga.; corrugated metal pipe 20,700
Elastic Stop Nut Corp., Union, N. J.; nuts 12,127
Elliott Bros. Steel Co., New Castle, Pa.; strip steel 21,293
Empire Mach. & Supply Corp., Norfolk, Va.; bolts 128,401
Stanley G. Flagg & Co., Inc., Philadelphia; tube fittings 12,634
Gabriel Co., Cleveland, Ohio; shell fin assy. 35,000
Goodyear Tire & Rubber Co., Inc., Akron, Ohio; canisters for gas masks 105,400
Graybar Elec. Co., Inc., Washington; pin shackles 83,413
Hart Mfg. Co., Inc., Louisville, Ky.; army range parts 10,020
Hyman-Michaels Co., San Francisco; relaying rail and track material 27,766
Ilsco Copper Tube & Products, Inc., Cincinnati; cable-terminal lugs 19,776
International-Stacey Corp., Columbus, Ohio; steel lookout towers. 12,442
Jones & Laughlin Steel Corp., Pittsburgh; steel, I-beams 65,000
Johnson Engineering Co., New York; stuffing tubes 18,395
Judson Steel Corp., Oakland, Cal.; reinforcing steel 36,473
Lansdowne Steel & Iron Co., Morton, Pa.; alloy steel forgings .. 29,600
Latrobe Elec. Steel Co., New York; tool steel 44,803
Lukens Steel Co., Coatesville, Pa.; steel, plates 3,099,200
McArdle & Cooney, Inc., Philadelphia; fittings and flanges 12,058
tube fittings 38,317
Maine Steel, Inc., South Portland, Me.; pin shackles 22,921
McKissick Products Corp., Tulsa, Okla.; wire rope blocks 19,338
Morton Mfg. Co., Chicago; ammunition chests 321,079
Murray Mfg. Corp., Brooklyn; 60 mm. shell 2,035,000
Omaha Steel Works, Omaha, Neb.; fabricated steel 536,610
Pacific Wire Rope Co., Los Angeles; wire rope 31,997
Patent Scaffolding Co., Inc., Long Island City, N. Y.; steel staging bents 12,266
Pfaudler Co., Rochester, N. Y.; steel tanks and kettles 43,782
Philco Corp., Philadelphia; fuze parts 2,113,590
Pittsburgh Screw & Bolt Corp., Pittsburgh; rivets and bolts ... 10,956
Presto Gas Mfg. Co., Chicago; field range 38,020
Hugh G. Purcell Co., Seattle; cast and wrought iron pipe 15,187
C. J. Rainear & Co., Inc., Philadelphia; flanges; welding neck, etc. 13,115
Republic Steel Corp., Massillon, Ohio; steel bar 17,767
H. H. Robertson Co., Pittsburgh; asbestos protected metal roofing 12,694
John A. Roebling's Sons Co., Trenton, N. J.; jackstays; pendants 200,797
Seattle Chain & Mfg. Co., Seattle, Wash.; chains and fittings 29,974
Seattle Steel Co., Seattle, Wash.; wire mesh 10,575
Standard Pressed Steel Co., Jenkintown, Pa.; steel cores 384,600
Summerill Tubing Co., Bridgeport, Pa.; steel tubing 18,513
Treadwell Construction Co., Midland, Pa.; pipe, dredge discharge; steel 30,960
Truscon Steel Co., Youngstown, Ohio; steel building 21,059
Weatherhead Co., Cleveland; couplings 17,136
Wheeling Corrugating Co., Wheeling, W. Va.; corrugated cans .. 12,671
Wheeling Steel Corp., Wheeling, W. Va.; roofing and ridge roll. 35,638
Worth Steel Co., Washington; steel plates 2,383,524
Vollrath Co., Sheboygan, Wis.; ladles; skimmer; spoons 33,490
Youngstown Sheet & Tube Co., Chicago; steel tubing 69,123
steel pipe 1,093,030

AWARDS

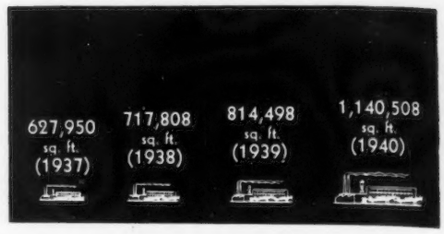
Nonferrous Metals & Alloys..$488,027

Chase Brass & Copper Co., Inc., Waterbury, Conn.; copper bus tubing $16,320
commercial brass 18,589
commercial bar 27,719
Cohn & Rosenberger, Inc., Providence; collar insignia 39,132
C-O-Two Fire Equipment Co., Newark; fire extinguishers ... 101,000
Englewood Elec. Supply Co., Chicago; aluminum castings 11,398
Grainger-Rush Co., Boston; lamp reflectors 22,760
Graybar Electric Co., Inc., Boston; lamp reflectors 11,020
R. W. Greeff & Co., Inc., New York; magnesium 15,650
International Metal Hose Co., Inc., Cleveland; flexible nozzle tubes. 18,178
International Nickel Co., New York; nickel-copper-alloy 51,885
Longines-Wittnauer Watch Co., Inc., New York; watches 14,907
Revere Copper & Brass, Inc., Baltimore Div., Baltimore; seamless brass pipe 10,487
brass pipe 68,193
Rex Products Corp., New Rochelle, N. Y.; collar insignia 10,072
Thinsheet Metals Co., Waterbury, Conn.; cartridge brass 21,060
George H. Wahn Co., Boston; lamp reflectors 13,285
Wilmot Castle Co., Rochester, N. Y.; field lamp 16,369

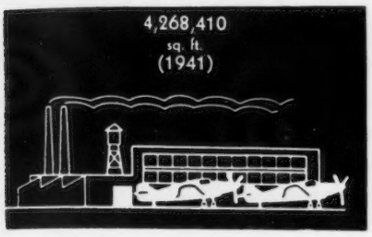
Other Machinery $8,521,365

American Laundry Mach. Co., Cincinnati; laundry equip. $250,638
American Locomotive Co. (Diesel Eng. Div.), Auburn, N. Y.; diesel engine 19,800
American Machine & Metals, Inc., E. Moline, Ill.; washing machines 40,921
Ames Iron Works Div., Pierce, Butler Radiator Corp., Oswego, N. Y.; hot water heating units. 47,826
Asheville Contracting Co., Asheville, N. C.; power shovel; tractors 12,050
Austin Bridge Co., Dallas; excavating and grading equipment. 21,942
Barnard Aviation Equip. Co., Inc., Ashley, Pa.; steel belt links ... 928,550
G. S. Blakeslee & Co., Cicero, Ill.; washing machs. 12,315
E. W. Bliss Co., Brooklyn; presses 25,431
J. Edward Bolich, Philadelphia; power plant unit 40,320
Brown & Sharpe Mfg. Co., Providence; milling machs. 78,925
Buda Co., Harvey, Ill.; parts for earth auger 25,913
diesel engine pts. 16,309
Buffalo Forge Co., Federal & Marine Dept., Washington; centrifugal ventilating fans 102,015
Busch-Sulzer Bros., Diesel Eng. Co., St. Louis; complete cylinders .. 13,307
Century Machine Co., Cincinnati; bakery equip. 13,452
Champion Machinery Co., Joliet, Ill.; bakery equip. 13,640
Chicago Pneumatic Tool Co., Philadelphia; pneumatic chipping .. 14,625
Cincinnati Elec. Tool Co., Cincinnati; pedestal and bench grinders 12,326
Cincinnati Shaper Co., Cincinnati; universal shaper 12,529
power shears 18,980
Colt's Patent Fire Arms Mfg. Co., Hartford; conversion units and magazines 15,885
pistols 549,083
Cyclops Iron Works, San Francisco; gantry crane 75,950
Dempster Bros., Inc., Knoxville; hoisting units 15,536
Detecto Scales, Inc., Brooklyn; counter scales 24,420

Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.; tank parts 12,660
Economy Heating Co., Portland, Ore.; hot air heating 13,008
Elwell-Parker Electric Co., Cleveland; tilting trucks 12,677
Engineering & Research Corp., Riverdale, Md.; blades for test clubs 76,000
Euclid Crane & Hoist Co., Euclid, Ohio; elec. hoists 178,795
Fairbanks, Morse & Co., Chicago; engine parts 11,311
Federal Elec. Co., Inc., Chicago; horns 47,733
Gardner-Denver Co., Washington; air compressors 16,341
General Elec. Co., Schenectady, N. Y.; control and heating equipment 129,955
locomotive 24,414
Goslin-Birmingham Mfg. Co., Birmingham; machining shell 1,803,000
G. A. Gray Co., Cincinnati; openside planer 32,510
Greenfield Tap & Die Corp., Greenfield, Mass.; dies, stocks, taps.. 68,712
Hardie Tynes Mfg. Co., Birmingham; air compressors 43,838
Harris Seybold Potter Co., Cleveland; lithographic presses 80,600
Hevi Duty Electric Co., Milwaukee; elec. pit furnaces 68,245
Independent Pneumatic Tool Co., Chicago; portable pneumatic drills 22,110
Ingersoll-Rand Co., New York; grinders, pneumatic; vibrators, concrete 33,703
pneumatic circular saws 15,427
International Harvester Co., Chicago; tractors 12,632
Almon A. Johnson, New York; elec. winches 97,845
E. A. Kinsey Co., Cincinnati; press brakes; squaring shears .. 40,494
R. K. LeBlond Mach. Tool Co., Cincinnati; lathes 37,345
Lidgerwood Mfg. Co., Elizabeth, N. J.; winches 37,548
Lindberg Engineering Co., Chicago; box type furnaces 94,106
Linwood Smith, Lake Village, Ark.; excavating and grading equipment 22,458
McCray Refrigerator Co., Kendallville, Ind.; refrigerating units.. 24,817
Modern Tool & Die Co., Philadelphia; gages 49,560
Monarch Machine Tool Co., Sidney, Ohio; precision lathes 27,509
lathes 14,965
Ohio Pattern Works & Foundry Co., Cincinnati; hand bilge pumps 10,464
Pittsburgh Screw & Bolt Corp., Pittsburgh; quilting pins 41,800
Pratt & Whitney Div., Niles-Bement-Pond Co., West Hartford; star gages 125,359
Prosperity Co., Inc., Syracuse, N. Y.; laundry presses 157,370
Robinson Mfg. Co., Muncy, Pa.; screening machs. 17,745
Rockford Machine Tool Co., Rockford, Ill.; openside planers 38,034
Roessler Machine Co., Elkins Park, Pa.; punches 11,240
Sandy Hill Iron & Brass Works, Hudson Falls, N. Y.; elec. winches 390,510
Sangamo Elec. Co., Springfield, Ill.; gears; pinions 15,567
Schutte & Koerting Co., Philadelphia; positive displacement pumps 11,617
motor driven pumps 55,416
Scripto Mfg. Co., Atlanta; boosters, metal parts 1,140,000
Stedfast & Roulston, Inc., Boston; indexing station machine 11,170
Stone Heating & Ventilating Co., Washington; ventilating fans .. 23,835
Taft-Peirce Mfg. Co., Woonsocket, R. I.; micrometer plug gages .. 12,614
Threadwell Tap & Die Co., Greenfield, Mass.; rifling head 24,000
Unipress Co., Inc., Minneapolis; laundry presses 47,990
U. S. Hoffman Machinery Corp., New York; laundry equip. 166,411
Warner Elevator Mfg. Co., Cincinnati; elec. elevator 16,725
turret lathes 54,912
Westinghouse Elec. & Mfg. Co., Washington; refrigerators 29,226
mortuary cabinets 74,168
Whitcomb Locomotive Co., Rochelle, Ill.; diesel locomotives .. 73,656



HOW U. S. PLANE PLANTS GROW: Wright Corp.'s airplane manufac- 1936. Three new plants, to be company's manufacturing space to



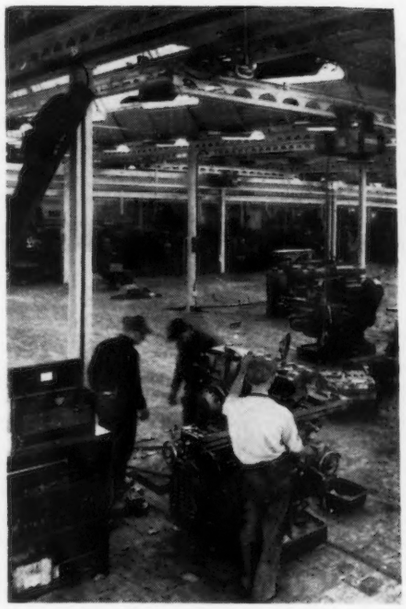
This chart shows how the Curtiss-turing division has grown since pleted in 1941, will lift the com-4,268,410 sq. ft.

I. J. White Co., New York; bakery equip. 11,449
Wisconsin Axle Div. of Timken Detroit Axle Co., Oshkosh, Wis.; power train; parts, control, etc. 247,434
Worthington Pump & Machinery Corp., Washington; turbine driven pumps 71,595
air compressors 29,291
Wright Aeronautical Corp., Paterson, N. J.; tank parts 58,758

Navy Dept., Bureau of Supplies and Accounts:

Aluminum Co. of America, Washington; aluminum alloy $708,390
American Brass Co., Waterbury, Conn.; tubing, copper, seamless 15,965
American Car & Foundry Co., New York; cocks, plug, straightway for plumbing and lubricant 31,170
American-La France-Foamite Corp., Elmira, N. Y.; parts for fire extinguisher 21,839
American Metal Co., Ltd., New York; tin, pig, grade "A" 172,916
American Rolling Mill Co., Middletown, Ohio; steel, sheet, flat, black 32,000
American Tool Works Co., Cincinnati; drills, radial, motor driven 9,386
drills, heavy duty 23,390
Anaconda Wire & Cable Co., New York; cable 117,308
Axelson Mfg. Co., Los Angeles; lathe, engine, heavy duty 5,604
Baldt Anchor, Chain & Forge Co., Chester, Pa.; anchors, steel, stockless 13,658
anchors, steel and chain 30,588
anchors, navy type 23,592
Otto Bernz Co., Inc., Rochester, N. Y.; pots, fire, gasoline 5,603
Bethlehem Steel Co., Bethlehem, Pa.; plates, shield 21,717
Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; press, hydraulic 8,690
Blackburn-Smith Mfg. Co., Inc., Hoboken; strainers 5,956
Bostitch, Inc., East Greenwich, R. I.; machines, paper fastening .. 11,700
S. F. Bowser & Co., Inc., Ft. Wayne, Ind.; gasoline meters .. 8,608
Bucyrus-Erie Co., South Milwaukee; crane, lifting, crawler type 9,366
Burke Electric Co., Erie, Pa.; ballasters, mine and release mechanisms 9,425
Buss Machine Works, Holland, Mich.; machine, wood, planing. 6,115
Camillus Cutlery Co., New York; jack-knives 27,853
Carlton Machine Tool Co., Cincinnati; machine, drilling 6,062
Caswell Strauss & Co., Inc., New York; tin, pig, grade "A" 347,466
Chase Brass & Copper Co., Inc., Waterbury, Conn.; pipe, brass, seamless 123,445
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.; parts for modification of bomb hoists 8,712
Cincinnati Milling Machine & Cincinnati Grinders, Inc., Cincinnati; machines, cylindrical grinding, hydraulic, universal, motor-driven 15,966
Clayton Mfg. Co., Alhambra, Cal.; units, steam generating and spare parts 125,934
Clemson Brothers, Inc., Washington; blades, hacksaw 69,225
Cooper-Bessemer Corp., Mount Vernon, Ohio; propelling machinery for 15 motor mine sweepers ... 1,860,000
Consolidated Supply Co., Portland; pipe, wrought iron 268,350
Crucible Steel Co. of America, New York; cutters, toolholders, lathe, tungsten-cobalt tool steel. 41,400
Cummins Engine Co., Washington; generator sets, voltage regulators and spare parts 73,852
Detroit Seamless Steel Tubes Co., Dearborn, Mich.; tubing, steel, seamless 14,912
Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.; generators and control boxes 76,495
starters, hand and electric 1,290,993
Edison General Electric Appliance Co., Chicago; ranges and ovens, electric 5,021

Electric Products Co., Cleveland; panels, welding control 57,000
George J. Fritz Foundry & Machine Co., St. Louis; plates, cast iron 40,289
General Cable Corp., Washington; cable, electric 485,484
General Electric Co., Schenectady; machines, welding 11,204
General Motors Corp., Chevrolet Div., Detroit; trucks, motor, 1½ ton 164,447
General Motors Corp., Cleveland Diesel Engine Div., Cleveland; piston, forged, electromotive parts, etc. 68,432
propelling machinery for 18 submarine chasers 7,650,000
158 sets of minesweeping generators 12,324,000
propelling machinery for minesweepers 20,941,000
General Motors Corp., Harrison Radiator Div., Lockport, N. Y.; coolers, oil 20,764
John H. Graham & Co., Inc., New York; blades, hacksaw 26,096
Haffner-Thrall Car Co., Chicago; cars, railway, steel 14,880
Wm. C. Hamilton Co., Seattle; cells, temperature test 19,079
Heil Co., Milwaukee; units, portable gasoline pumping 103,970
Holley Carburetor Co., Detroit; carburetors 5,568



NATIONAL DEFENSE can't wait: That's the slogan at the Monarch Machine Tool Co., Sidney, Ohio, where a new $150,000 plant addition has been completed in 60 days from the day ground was broken. The

Hooven, Owens Rentschler Co., Hamilton, Ohio; spare parts for main generator diesel engine .. 35,288
International Diesel Electric Co., Inc., New York; sets, generator, and spare parts 249,727
International Machine Tool Corp., Indianapolis; lathe, turret, saddle type 23,945
International Silver Co., New York; tableware, corrosion-resisting 89,445
Keuffel & Esser Co., Hoboken, N. J.; instruments, drawing 8,906
Kollsman Instrument Div., Square D Co., Elmhurst, N. Y.; transmitters, compass; indicators, compass 246,000
A. Kreamer, Inc., Brooklyn; measures, copper 10,184
Lehmann Machine Co., St. Louis; lathe, 24 in. 8,670
Leland-Gifford Co., Worcester, Mass.; machines, drilling 16,470
Leslie Co., Lyndhurst, N. J.; whistles, steam 5,870
Lukenweld, Inc., Coatesville, Pa.; additional plant facilities 2,400,000
Mack Mfg. Corp., Washington; trucks, tractor, motor, etc. 70,899
Mercer Tube & Mfg. Co., Sharon, Pa.; pipe, steel 78,754
Michigan Tool Co., Detroit; gears, turret turning, worm gearing and pinions, etc. 99,140
Morton Mfg. Co., Muskegon Heights, Mich.; machine, horizontal, drilling, milling, etc. ... 81,750
National Electric Products Corp., Pittsburgh; cable, electric 468,582
Northill Co., Inc., Glendale, Cal.; anchors, steel cast or forged galvanized 12,209
Okonite Co., Passaic, N. J.; cable 49,370
Oliver Instrument Co., Adrian, Mich.; grinders, drill, motor-driven 6,655
Penn Tool Co., Philadelphia; punches, center, drive-pin 8,878

machines (in the foreground) are already in operation. Half a million dollars worth of new machine tool equipment is going into this new addition.

Phelps Dodge Copper Products Corp., Habirshaw Cable & Wire Div., New York; cable, electric. 1,519,410
Pioneer Instrument Div., Bendix Aviation Corp., Bendix, N. J.; gages, manifold pressure 5,800
Pratt & Whitney Div. of Niles-Bement-Pond Co., West Hartford; grinder, surface, vertical, spindle, motor-driven 9,433
grinders, hydraulic gear, motor-driven 25,190
machines, vertical miller and profiler 9,200
Henry Prentiss & Co., Inc., New York; machine, boring, drilling and milling 9,116
Revere Copper & Brass, Inc., Baltimore Div., Baltimore; tubes, condenser, copper-nickel-alloy .. 117,292
tubing, copper 96,667
Reynolds Metal Co., Louisville, Ky.; aluminum, alloy 2,963,566
Robins Shipbuilding & Welding Corp., Delanco, N. J.; motor car ferry 42,624
Schroeder Brothers Mfg. Co., Torrington, Conn.; frames, hacksaw 7,270
Selas Co., Philadelphia; heaters .. 6,590
Singer Sewing Machine Co., New York; machines, sewing 16,980
Struthers Wells-Titusville Corp., Titusville Forge Div., Titusville, Pa.; shafts, propeller, steel 77,200
Henry G. Thompson & Son Co., New Haven, Conn.; blades, hacksaw 19,283
Thorrez & Maes Mfg. Co., Jackson, Mich.; bodies, steel 12,765
Tidewater Supply Co., Inc., Norfolk, Va.; machine, boring, drilling and milling 15,210
Theo. C. Ulmer, Inc., Philadelphia; sockets, steel 17,364
United Aircraft Corp., Pratt & Whitney Aircraft Div., East Hartford; additional machinery and equipment 9,606,920
improvements and buildings 3,522,080
U. S. Brass Turning Co., Inc., New York; syringes, oil, brass. 8,192
Viking Instruments, Inc., Stamford, Conn.; makers, contact .. 17,718
Waltham Watch Co., Waltham, Mass.; clocks, aircraft 90,000
Walsh Construction Co., J. Rich Steels, Inc., Cauldwell-Wingate Co., and Raisler Corp., New York; construction of shipbuilding drydocks 31,900,000
Weinman Pump Mfg. Co., Columbus, Ohio; pumps, circulating .. 5,600
S. Weinstein Supply Co., New York; hoists, chain, spur-gear, type "C" 8,971
C. H. Wheeler Mfg. Co., Philadelphia; machinery, airplane crane, hoisting and rotating 366,150
Wheeling Corrugating Co., Wheeling, W. Va.; cans, ash and garbage 29,900
White Sewing Machine Co., Cleveland; machines, sewing 8,265
Worthington Pump & Machinery Corp., Washington; pumps and parts 279,686
Wright Aeronautical Corp., East Paterson, N. J.; additional plant and equipment 1,925,000
Yarnall-Waring Co., Philadelphia; gages and fittings 12,132
Youngstown Sheet & Tube Co., Youngstown, Ohio; steel, sheet.. 38,985

War Dept., Other Agencies:

Acme Shear Co., Bridgeport, Conn.; scissors	$11,400
Bendix Aviation Corp., Pioneer Instrument Div., Bendix, N. J.; maintenance parts	609,474
General Electric Co., Schenectady; generators and auxiliaries	2,858,300
General Electric X-Ray Corp., Chicago; machines	41,150
Fred Haslam & Co., Inc., Brooklyn; forceps	13,130
Nash Kelvinator, Detroit; trailers	1,029,915
Superior Sleeprite Corp., Chicago; hospital beds	87,000
M. R. Thomason, Montgomery, Ala.; parachute training towers	7,460
Wright Aeronautical Corp., Paterson, N. J.; maintenance parts	570,584

War Dept., Ordnance:

Aluminum Co. of America, Washington; aluminum	$101,902
Atlas-Boxmakers, Inc., Chicago; belt links	5,570
Automotive Maintenance Machinery Co., North Chicago; tools	8,274
Bendix Aviation Corp., Eclipse Aviation Div., Bendix, N. J.; tank parts	12,660
Brown & Sharpe Mfg. Co., Providence; calipers, gages and parallels	6,208
Cleveland Tractor Co., Cleveland; tractor parts	16,168
Colt's Patent Fire Arms Mfg. Co., Hartford; small arms materiel	81,586
County Supply Co., Plainfield, N. J.; cutters, drills and shapers	24,433
Dana Tool-D Nast Mach Co., Philadelphia; wrenches	5,065
expanding mandrels	7,028
Duffield File & Tool Co., New York; files	5,176
J. R. Edwards Machinery Co., Newark; bench lathes	96,640
Electric Arc Cutting & Welding Co., Newark; generators, welding	35,330
Ever-Tite Mfg. Co., Davenport, Iowa; shell adapters	58,710
General Railway Signal Co., Rochester, N. Y.; artillery materiel	38,360
Gilbert & Barker Mfg. Co., West Springfield, Mass.; water chests	151,240
Great Lakes Steel Corp., Ecorse, Detroit; steel	5,231
Louis Hanseen's Sons, Davenport, Iowa; jacks	7,094
Independent Pneumatic Tool Co., Chicago; hoists	6,883
International Harvester Co., Chicago; tractors	12,632
Magnus Tool & Die Co., Newark; tools	10,525
Mesta Machine Co., Pittsburgh; barbette carriages	8,211,800
Midvale Co., Nicetown, Pa.; forgings	22,456
Morse Twist Drill & Machine Co., New Bedford, Mass.; reamers	16,207
Nicholson File Co., Providence; files	9,885
Niles-Bement-Pond Co., West Hartford; gages	125,359
Reliable Tool Co., Irvington, N. J.; tools	14,118
John A. Roebling's Sons, Chicago; cable	8,180
Roessler Machine Co., Elkins Park, Pa.; tools	11,240
Rudolph & West Co., Washington; wrenches	17,371
Seamless Products Co., New York; oil cans	14,072
Sheffield Gage Corp., Dayton, Ohio; inspection gages	9,800
L. S. Starrett Co., Athol, Mass.; tools	5,388
Union Hardware Co., Torrington, Conn.; cleaning rods	6,084
Wellman Engineering Co., Cleveland; barbette carriages	7,924,200

Month's Steel Exports Decline 127,936 Tons

• • • **Exports of iron and steel** products (other than scrap) from the United States in February totaled 525,862 gross tons valued at $34,637,943, preliminary figures released by the Durable Materials Unit of the Bureau of Foreign and Domestic Commerce reveal. In January this trade had amounted to 653,798 tons valued at $39,691,003, while in February, 1940, 436,585 tons of these products valued at $33,361,201 had been dispatched to foreign customers.

Despite February's showing exports over the first two months of 1941 stand at 1,179,660 tons valued at $74,328,946 against totals of 832,649 tons and $64,514,566 for the comparable period of 1940.

February also saw shipments to every Continental area other than Europe increase materially. The trade with Europe stood at 260,682 tons against 462,137 tons in January, but the countries of North and Central America and the West Indies received 107,542 tons of American iron and steel against 92,165 tons; shipments to South America rose to 68,177 tons from 24,907 tons, with the Far East taking 55,359 tons against 49,123 tons, and Africa 34,102 tons against 25,466 tons.

Leading individual markets in February were the United Kingdom, 248,447 tons; Canada, 75,591 tons; Brazil, 25,526 tons; the Union of South Africa, 24,699 tons, and the Netherlands East Indies, 22,132 tons.

As in recent months, non-alloy steel ingots, blooms, billets, etc., was the month's leading export commodity with exports totaling 114,652 tons of which 94,058 tons went to the United Kingdom and 11,349 tons to Canada. Second place went to pig iron with shipments of 46,843 tons of which the United Kingdom received 42,381 tons, while alloy steel ingots placed third with a total of 40,568 tons. Other outstanding products in the February export trade were plain structural shapes, 34,012 tons, and non-alloy black steel sheets, 33,943 tons.

NEWS OF INDUSTRY

Spring Welding Conference May 9 At Cleveland

Cleveland

• • • **May 9th is the** date set for the Spring Welding Conference which is being repeated this year by the Cleveland section of the American Welding Society. There will be two sessions, one afternoon and one evening. In the afternoon the following talks will be given: "New Developments in Oxy-acetylene Welding," by A. N. Kugler, applied engineering dept., Air Reduction Sales Co.; "Heat and Mechanical Stresses in Welding," by W. G. Theisinger, director of welding and research, Lukens Steel Co.; and "Can It Be Spot Welded?" by R. T. Gillette, welding engineer, General Electric Co. Elmer E. Isgren, general superintendent, R. G. LeTourneau, Inc., will address the evening session on the subject, "Welding from the Manufacturer's Viewpoint." All sessions of the conference will be held at Hotel Statler.

Steel Warehouse Chapters Elect Officers

Cleveland

• • • **The Cincinnati Chapter** and the Northern Ohio Chapter of the American Steel Warehouse Association have elected officers for the coming year as follows, according to W. S. Doxsey, executive secretary.

Cincinnati Chapter: president, W. A. Kruse, Jr., Union Iron & Steel Co., Cincinnati; vice president, G. E. Mayer, Jones & Laughlin Steel Corp., Cincinnati; vice president, L. E. Dallas, Peninsular Steel Co., Dayton; secretary, D. L. McCubbin, Jos. T. Ryerson & Son, Inc., Cincinnati; treasurer, L. E. Denman, C. R. Talbott Co., Cincinnati; national director, J. A. Thiele, Miami-Dickerson Steel Co., Dayton.

Northern Ohio Chapter: president, W. O. Kurtz, Peninsular Steel Co.; vice president, R. M. Beutel, Paterson-Leitch Co., secretary-treasurer, A. Hurschman, Sandvik Steel; all of Cleveland.

G-E Orders Up 164%

• • • **General Electric Co.** orders in the first quarter of 1941 totaled $257,382,000 against $97,490,000 in the like 1940 period, an increase of 164 per cent.

New Super-Price Agency Opposes Advance in Steel

Washington

• • • **The newly-created** Office of Price Administration and Civilian Supply last week went on record against any increase in steel prices with an assertion by Price Administrator Leon Henderson that present steel prices already are 5 per cent above the level of 1929 prices in the industry.

(Leon Henderson's statement that present steel prices are 5 per cent above those of 1929 was not explained in detail. Present published steel prices as shown by THE IRON AGE composite of 2.261c. a lb. ($45.22 a net ton) average $1.38 a ton above the lowest monthly composite price of 1929, which was 2.192c. The 1929 average of 2.209c. a lb. was $1.04 below the present composite price. Steel mill wages average 31½ per cent higher than in 1929 based on the present hourly average of 86c. against 65.4c. at that time. Steel scrap prices are higher, the current composite of $19.17 being $2.87 above the 1929 average.)

Holding his first press conference since the establishment of the new super-price agency, Mr. Henderson declined to say what his division would do in the event of a rise in steel prices, although earlier in the session he announced that as a general thing the agency plans to invoke "economic sanctions" rather than "legal sanctions" on the theory that no amount of penalizing can be a substitute for additional supply. He said that the biggest weapon to be handled by his division will be "the moral support of the community."

The former NRA economist and White House adviser conceded that in the steel industry concessions have disappeared, low-cost contracts are out of the way, all low-price scrap has been consumed, prices of pig iron are causes for concern and that in general the industry is under price and cost pressure, in which the price division is taking a major interest.

Mr. Henderson shied away from the question of wage developments in the industry, but pointed out that any "unwarranted wage in-

Defense Program Will Need 4 Million Men

Chicago

• • • Four million new men will be required by the defense program the remainder of 1941. Two million new jobs will also be created in lines which furnish food, clothing, shelter and amusement for the hordes of new labor in defense industry. This was the prophecy of C. R. Dooley, Washington, director of the government's "Training Within Industry" program. Dooley and other industrial, educational and government leaders recently spoke to 1200 manufacturers here in a panel discussion on "Securing and Retaining an Adequate Labor Supply."

Mr. Dooley declared that two thirds of the new labor requirements will be skilled in only one operation or be untrained completely. The answer to training these men lies in breaking down each skilled job into its components and making each component small and simple enough so that it can be learned in a short time; and instruction should be intensified in each detail of the operation.

creases" in the industry are subjects for weighing by his division. He was vague in proceeding with this line of reasoning and answered with an "that all depends" when asked if he expected any increase in steel wages to come out of profits or prices. Questioned on what he thought should be the allowable profits of the United States Steel Corp., Mr. Henderson replied that he would have to consult with the corporation in that respect.

Earlier in his conferences last Saturday, Mr. Henderson volunteered the information that his division is interested in prices of steel, coal, chemicals, non-ferrous metals, machinery and equipment, building supplies as well as hides, textiles, drugs and paper. He warned against interpreting his statement as indicating that price ceilings would be established for these products, placing them instead in the category of products his division has under price scrutiny.

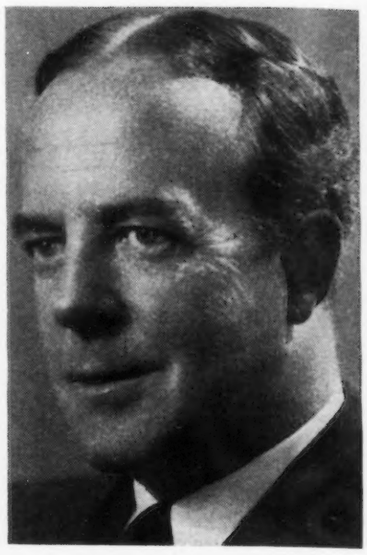
Establishment of the new super-price agency, announced at the White House on April 11, vests in Mr. Henderson broader discretionary power to control prices and crack down on violators. It removes the New Deal economic adviser from the relatively obscure role of price division head of the National Defense Advisory Commission and places his new organization on a par with the much-publicized Office of Produtcion Management.

Mr. Henderson's new price set-up not only will absorb the former Consumers Division of the National Defense Advisory Commission, but certain duties delegated to him appear to overlap substantially with the existing powers of OPM's priorities division headed by Edward R. Stettinius, Jr., and the purchasing division under the direction of Donald M. Nelson. Mr. Henderson, for example, has been given power to provide for the "equitable distribution of the residual

supply of materials to meet civilian demands after military defense needs have been satisfied"; and in connection with defense purchasing policies can advise the OPM on the procurement, production, planning, priority, and other actions the effect of which may be to diminish the supply of materials and commodities available for civilian use."

Theoretically, the Henderson duties with reference to priorities and allocations would start, and Mr. Stettinius' job would end, where civilian requirements are considered and after military needs have been met, although the executive order establishing the new super-price agency did not explain how a clear-cut demarcation between these two factors could always be made.

Mr. Henderson admitted at his conference that overlapping is involved, but he observed that Mr. Stettinius is "easy to get along with" and that the whole matter will be made the subject of discussions between the two divisions involved.



H. G. BATCHELLER, president of Allegheny Ludlum Steel Corp., has been appointed to the Office of Production Management's Priorities Division. Mr. Batcheller will be the industrial users' representative in the ferrous metals and alloys division.

Before the inception of the new super-price agency, this paragraph in the executive order establishing the Henderson division could well have been used to describe a phase of Mr. Nelson's activities as director of OPM's division of purchases:

"Advise and make recommendations to other departments and agencies, whenever the Administrator deems it appropriate, in respect to the purchase or acquisition of materials and commodities by the government, the prices to be paid therefor, and in respect to such of their other activities as may affect the price of materials and commodities."

Even the OPM production division will not be completely free from the influence of Mr. Henderson as the new czar of prices and civilian supply. The White House order specifically empowers the Henderson agency to "stimulate the utilization of substitutes by civilians for consumer goods and commodities of limited supply," and to

formulate programs for consumer standards.

Moreover, the new price organization feels that it has such an interest in industrial capacity that it has plans to set up a defense economic section whose job will be to concern itself with production, demand and capacity. Mr. Henderson was asked specifically about the Gano Dunn report to the President on steel, but he insisted that he knew little or nothing about the findings, it having been completed while he was away from Washington, but commented that "hardly a day goes by when the problem of steel capacity is not up for discussion."

Also to be created under the Henderson wing will be a consumer division, a price division, a civil supply division, a legal division and a defense finance division. He plans also to call in a number of consultants to advise on a wide variety of problems. Most of work on price reporting will be farmed out to the Bureau of Labor Statistics.

Enforcement powers delegated to Mr. Henderson include the draft-industry provision of the Selective Service Act, which could be invoked by the President upon the recommendation of the new price administrator. Other powers vested in Mr. Henderson to crack down on violators could be taken on his own motion, but such steps could be vetoed by the Secretary of War or the Secretary of the Navy.

Mr. Henderson regards the executive order creating his new price division as giving him practically all the powers of controlling prices which were vested in the War Industries Board during the World War. In addition to this, he feels that the government today has considerably more price and supply information on hand because of the increased attention given the supply factor and to the necessity of close bargaining in the purchase of supplies by the government.

As the government becomes more deeply involved in its price-fixing machinery, Mr. Henderson could appoint an unlimited number of price advisory committees. Indeed, the White House order itself establishes a Price Administration Committee composed of representatives of seven government agencies to make findings and submit recommendations on the fixing of maximum prices, commissions, margins, and other elements of cost or price of materials. Represented on the committee would be the Secretary of the Treasury, the Secretary of Agriculture, the Federal Loan Administrator, Chairman of the Tariff Commission, Chairman of the Federal Trade Commission, and the OPM Director General and the Associate Director General. Mr. Henderson will be chairman of the committees.

Broken down further, the executive order gives Mr. Henderson power to:

1. Take all lawful steps to prevent price spiraling, rising costs of living, profiteering, and inflation resulting from market conditions.

2. Prevent speculative accumulation, and hoarding and stimulate provision for the necessary supply of materials for civilian use.

3. Study civilian requirements and price trends, and the impact of the defense program on civilian living standards; exercise certain powers delegated to the President under the Tariff Act with respect to studies and investigations.

4. Determine and publish after investigation maximum prices, commissions, margins, fees, charges, or other elements of cost or price, and take lawful and appropriate steps to facilitate their observance.

5. Inform OPM of the relative importance of materials for civilian use, and advise with reference to procurement, production, planning, priority, and other actions.

6. Maintain liaison with other government agencies and any public or private agencies designated by the Administrator.

7. Advise on proposed or existing legislation and recommend additional legislation on prices, rents, and the equitable distribution of materials for civilian use.

8. Keep the President informed of progress made by the agency.

Mr. Henderson's press conference was the occasion of a half-hour statement by the new price administrator, in which he set forth his economic theories in terms of "the present era of high production." In this connection he emphasized the necessity of keeping the proper relationship between prices and costs and affording consumer protection.

18 Makers of Heavy Forgings Meet Again

Washington

• • • **For the second** time in two weeks, manufacturers of heavy forgings were expected to meet with OPM and other government representatives on Wednesday to complete details on plans to expand production facilities to meet the increasing requirement of the Army and Navy and Maritime Commission and the needs arising since the passage of the lend-lease act.

After meeting with government spokesmen on April 11, it was announced that any further expansion of facilities will be in addition to an expansion of heavy forgings capacity begun last fall.

Companies were represented at the meetings:

Allis-Chalmers Mfg. Co.; American Forge Co., Berkeley, Calif.; American Locomotive Co.; Standard Steel Works Division of Baldwin Locomotive Works; Bethlehem Steel Co.; Camden Forge Co.; Carnegie-Illinois Steel Co.; Crucible Steel Co.; Erie Forge & Steel Co.; Finkl & Sons Co.; Heppenstall Co.; Isaacson Iron Works, Seattle, Wash.; Midvale Steel Co.; Mesta Machine Co.; National Forge & Ordnance Co.; Pennsylvania Forge Co.; Struthers-Wells Co.; and Pullman-Standard Mfg. Corp.

A.S.M.E. To Hold Defense Conference At Philadelphia

• • • **The American** Society of Mechanical Engineers will hold a management conference on national defense at the Engineers Club, 1317 Spruce Street, Philadelphia, on April 22-23, when Robert L. Mehornay, OPM director of defense contracts, and L. B. Coon, planning manager, Sperry Gyroscope Co., will speak on "Subcontracting Problems." The topic of "Labor Relations Under National Defense" will be discussed by Dr. John E. Steelman, Department of Labor conciliator; Fred A. Krafft, labor relations director American Viscose Corp., Wilmington, Del.; and Clinton S. Golden, SWOC official. S. Ray, chief inspector of the manufacturing division, Wright Aeronautical Corp., will speak on "Quality Control."

Plane, Ship, Shell Plants to Expand

Washington

• • • **The Defense Plant Corp.** has made an agreement with Willamette Iron & Steel Corp., Portland, Ore., whereby Willamette will increase its original shipbuilding plant expansion contract of $1,000,000 to $1,542,000.

The government corporation has made an agreement with Crucible Steel Co. of America for the acquisition of additional shell-making machinery for use in the company's plant at Harrison, N. J., at a cost of $1,500,000.

The Navy has contracted with United Aircraft Corp., East Hartford, Conn., for construction, acquisition and installation of additional plant facilities and equipment at East Hartford and Pawcatuck, Conn., at a maximum cost of $1,035,400.

Defense Plant Corp., at the request of the War Department, has entered into a lease agreement with the Wellman Bronze & Aluminum Co., Cleveland, for plant expansion for the manufacture of magnesium castings. The cost of the expansion will amount to approximately $194,221, of which $116,250 will be for land and buildings and $77,971 for equipment. The defense agency has also made a lease agreement with the Eaton Mfg. Co., Saginaw, Mich., for expansion for the manufacture of parts for airplanes.

The Defense Plant Corporation has agreed to purchase equipment and tools costing $92,816 to be leased to the Hudson Motor Car Co., Detroit.

Society to Discuss Plastics in Defense

• • • **Plastics in the** national defense program will be the highlight of the program arranged for the annual meeting of the Society of the Plastics Industry at Hot Springs, Va., on May 4, 5 and 6. Representatives from the ordnance section of the War Department and the Office of Production Management will head the list of speakers discussing various phases of the part plastics are playing in national defense.

Lieut. Col. K. F. Adamson of the War Department will discuss "What the Ordnance Department Expects of Plastics." James A. Lee, managing editor of *Chemical and Metallurgical Engineering*, will speak on "Available and Future

March Steel Output at New Peak, Hits 100%

• • • **Steel production** during March established a record of 7,146,372 net tons, equivalent to 100 per cent of the rated capacity of the industry, according to the monthly report of the American Iron and Steel Institute.

The March total was 14 per cent above output of 6,250,413 tons of steel in the short month of February, and exceeded by 63 per cent the total of 4,390,090 tons produced in March, 1940.

Total steel production in the first quarter of this year likewise reached a new peak of 20,339,869 tons, an average of 98 per cent of capacity. Output for the quarter was close to 40 per cent above the first quarter of 1940 when production was 14,685,960 tons, or 72.4 per cent of capacity.

Operations at 100 per cent of rated capacity, such as took place during March, do not represent a production ceiling for the industry. The rated capacity is the sum total of maximum output attained in recent years by each furnace in the industry, less a deduction of about 11 per cent taken off for shutdowns and repairs.

In practice, the steel industry could, by reducing the length of its shutdowns, lift output as much as 2.5 per cent above rated capacity in a year, and for shorter periods it could probably operate at an even higher rate.

During March, the total tonnage of steel produced represented an average output of 1,613,177 tons a week, which compares with average output of 1,562,603 tons a week in February and with 990,991 tons a week in March, 1940. Average rate of operation in February was 96.8 per cent of capacity, as against 63.5 per cent in March a year ago.

Based on reports by companies which in 1939 made 98.26% of the open hearth, 100% of the bessemer and 84.39% of the electric ingot and steel for castings production

Period	Estimated Production—All Companies								Calculated Weekly Production, All Companies	Number of Weeks
	OPEN HEARTH		BESSEMER		ELECTRIC		TOTAL			
	Net Tons	Percent of Capacity	Net Tons	Percent of Capacity	Net Tons	Percent of Capacity	Net Tons	Percent of Capacity		
January	6,282,713	99.2	451,637	76.0	208,734	95.0	6,943,084	97.1	1,567,288	4.43
February	5,683,104	99.3	378,330	70.5	188,979	95.2	6,250,413	96.8	1,562,603	4.00
March	6,473,116	102.2	460,169	77.4	213,087	97.0	7,146,372	100.0	1,613,177	4.43
1st Quarter	18,438,933	100.3	1,290,136	74.8	610,800	95.8	20,339,869	98.0	1,581,638	12.86

Note—The percentages of capacity operated are calculated on weekly capacities of 1,430,102 net tons open hearth, 134,187 net tons bessemer and 49,603 net tons electric ingots and steel for castings, total 1,613, 892 net tons; based on annual capacities as of December 31, 1940, as follows: Open hearth 74,565,510 net tons, bessemer 6,996,520 net tons, electric 2,586,320 net tons.

Supplies of Chemicals for the Plastics Industry." Dr. D. P. Morgan of the OPM will go into the question of priorities, while W. J. McCortney, manager of the rubber and plastics laboratory of the Chrysler Corp., will discuss "Substitution of Plastics for Metals."

Headquarters of the society are at 295 Madison Avenue, New York.

Scrap Imports 646 Tons

• • • **Increasing slightly** in quantity although smaller in value, imports of iron and steel products (scrap excepted) into the United States totaled 646 gross tons valued at $143,126 in February, preliminary figures released by the Durable Materials Unit of the Bureau of Foreign and Domestic Commerce show.

Canada's War Orders For Week $13,083,155

Toronto

• • • **For the week ending March** 28 Canada's Department of Munitions and Supply placed 1719 contracts of total value of $13,083,155, of which orders valued at $222,781 were placed with United States companies. Awards for the week include:

Capital expenditure — Clark Ruse Aircraft, Ltd., Halifax, N. S., $925,751; Dominion Rubber Co., Ltd., Montreal, $163,470; Frost & Wood Co., Ltd., Smiths Falls, $199,560; Canadian Elevator Equipment Co., Ltd., Toronto, $61,270; The De Havilland Aircraft of Canada, Ltd., Toronto, $263,265; Gutta Percha & Rubber Co., Ltd., Toronto, $30,074; MacDonald Bros. Aircraft, Ltd., St. James, Man., $48,171.

Metals—Canada Wire & Cable Co., Ltd., Toronto, $49,718; Atlas Steels, Ltd., Welland, Ont., $28,859.

Munitions—Dominion Arsenals, Ottawa, $259,200.

Ordnance — Sorel Industries, Ltd., Sorel, Que., $233,280; Dominion Foundries & Steel, Ltd., Hamilton, $333,057; Canadian Locomotive Co., Ltd., Kingston, $38,435.

Fire fighting equipment—Walter Kidde & Co. of Canada, Ltd., Montreal, $115,768; C-O-Two Fire Equipment of Canada, Ltd., Toronto, $81,850.

Aircraft—Boeing Aircraft of Canada, Ltd., Vancouver, B. C., $5,000,000; Canadian Pratt &

U. S. Steel Exports Drop to 600,240 Tons in February

IMPORTS					EXPORTS			
February		Two Months Ended February			February		Two Months Ended February	
1941	1940	1941	1940		1941	1940	1941	1940
....	2,032	....	3,946	Pig iron	46,843	18,927	127,165	33,984
11	1,764	11	3,787	Ferromanganese and Spiegeleisen[1]	455	5,069	807	5,477
49	40	90	309	Ferrochrome and ferrosilicon[1]	1,449	....	4,140	.....
...	100	....	150	Other ferroalloys[1]	75	473	778	1,220
...	160	23	172	Sponge iron	*	....	.....	.....
150	273	167	715	Scrap: iron, steel, tin plate	74,378	234,716	119,433	422,173
210	*4,369*	*291*	*9,079*	*Pig iron, ferroalloys and scrap*	*123,200*	*259,185*	*252,323*	*462,854*
....	22	....	226	Ingots, blooms, billets, sheet bars	114,652	65,794	316,535	123,988
*	....	....	....	Ingots, etc.: stainless, other alloy	40,568	1,277	95,759	3,385
*	....	....	....	Skelp	10,341	3,388	21,369	11,923
21	499	21	1,536	Wire rods	12,592	14,417	23,447	23,712
21	*521*	*21*	*1,762*	*Semi-finished steel*	*178,153*	*84,876*	*457,110*	*163,508*
1	20	2	28	Sheets, black iron and steel[2]	34,531	41,119	71,909	74,182
*	....	....	....	Sheets, galvanized iron and steel	13,086	16,175	19,154	33,160
*	....	....	....	Sheets, alloy steel	550	455	1,085	1,017
*	....	....	....	Sheets, stainless	78	151	128	392
3	1	4	2	Plates, plain and fabricated	40,895	38,780	93,308	62,845
*	....	....	....	Plates, alloy	569	383	753	556
*	....	....	....	Plates, stainless	37	9	126	13
18	148	37	548	Bars, merchant and reinforcing	50,190	47,940	92,111	92,822
....	39	....	124	Bars, iron[3]	187	2,176	307	3,625
*	....	....	....	Bars, alloy steel	1,601	1,325	8,748	2,925
*	....	....	....	Bars, stainless	67	58	116	138
5	196	19	385	Bars, hollow steel	*	....	.....	.....
....	52	....	357	Hoops, bands, strips, cotton ties	12,984	13,507	31,037	31,603
*	....	....	....	Hoops, bands, strip: alloy steel	130	16	156	91
*	....	....	....	Hoops, bands, strip: stainless	39	36	102	136
*	....	....	....	Piling, sheet	1,865	13	2,326	1,984
....	83	....	299	Structural shapes	34,012	13,008	71,764	27,537
24	....	43	....	Structural material, fabricated[4]	5,604	6,785	10,236	13,839
1	11	22	14	Tin plate, terne plate, taggers' tin	14,560	61,042	24,664	125,970
*	....	....	....	Tanks, steel	2,438	1,535	6,352	3,492
*	....	....	....	Pipe, welded iron and steel	9,263	10,272	17,268	19,008
339	193	341	605	Casing and oil line pipe	9,200	20,405	13,661	39,426
*	....	....	....	Boiler tubes	3,063	2,438	7,745	4,197
21	120	24	320	Wire, round iron and steel, telephone	6,451	7,692	9,663	14,313
6	82	40	163	Wire rope, strand, other products	1,360	913	3,134	1,763
*	....	....	....	Wire barbed, woven products	4,444	2,310	6,852	5,409
103	237	288	467	Wire flat, all other types	10,919	9,131	16,736	18,840
....	7	4	45	Nails, tacks and staples	924	374	1,358	897
2	19	4	24	Bolts, nuts, rivets, washers, etc.	2,734	1,185	6,111	2,266
19	186	19	295	Rails and track material	25,319	14,435	45,055	21,886
....	6	....	6	Die blocks or blanks, etc.	*	....	.....	.....
....	....	....	3	All other finished steel	1,595	1,595	9,313	4,287
542	*1,400*	*847*	*3,685*	*Rolled and finished steel*	*288,695*	*315,263*	*571,278*	*608,619*
....	419	....	419	Cast iron pipe and fittings	3,898	8,171	6,493	11,207
*	....	....	....	Malleable iron pipe fittings	302	516	844	1,014
23	31	60	69	Castings, forgings: iron and steel	4,269	1,966	7,395	4,850
*	....	....	....	Castings, forgings: alloy and stainless	479	293	1,347	780
*	....	....	....	Carwheels and axles	1,244	1,031	2,303	1,990
23	*150*	*60*	*488*	*Castings and forgings*	*18,382*	*11,977*	*18,382*	*19,841*
796	6,740	1,219	15,014	Total	600,240	671,301	1,299,093	1,254,822

[1] In imports the tonnage shown is the alloy content—the manganese, chromium, and silicon content, as the case may be. [2] Imports include skelp and saw plate. [3] Import figures include iron slabs. [4] Imports include sashes and frames only.
* No separate figures.

Whitney Aircraft Co., Ltd., Longueuil, Que., $101,135.

Instruments (technical)—Canadian Westinghouse Co., Ltd., Hamilton, $444,977.

Shipbuilding—J. H. LeBlanc Shipbuilding Co., Weymouth, N. S., $170,000; Grand Trunk Pacific Development Co., Montreal, $1,320,000; Hunt Boats, Orillia, $170,000; Honey Harbour Navigation Co., Ltd., Midland, $170,000; Midland Shipyards, Ltd., Midland, $1,180,000; Mac-Craft Corporation, Ltd., Wallaceburg, $170,000; Armstrong Bros., Victoria, B. C., $104,050.

Machines Reported Holding Up New Fuse Contracts

Chicago

• • • **Shortage of** eight-spindle automatic screw machines is making it more difficult to place new fuse contracts, according to some defense contractors. Machines are needed for machining the fuse bodies from bar stock—but there aren't enough new machines available right now. Changing to a forging enables broaches and turret lathes to do the work but at a cost which the War Department says is prohibitive.

Follansbee Shipments A Record

Pittsburgh

• • • **Follansbee Steel Corp.** announces that its new cold strip mills are now operating 20 turns per week. The company recently achieved a shipment record, moving out in one day a total of 30 cars of finished and semi-finished steel.

First Todd-Bath Unit Built

Boston

• • • **A large steel plate** storage plant, the first unit of the new Todd-Bath Iron Shipbuilding Corp., South Portland, Me., to be completed, has just been turned over to the owners by the Sanders Engineering Co.

"T" Man Guards Martin Plants

• • • **E. A. Schurman,** superintendent of uniformed guards of the U. S. Treasury Department, has resigned to become "chief of protection" for Glenn L. Martin Co.'s aircraft factories, makers of bombers for Britain and for U. S. defense.

March Gear Sales Up 10%

FOR the third successive month, sales of industrial gears, excepting automotive gears and gears used in high speed turbine drives, set an all-time high. March sales volume, as measured by the index of the American Gear Manufacturers Association, reached 288, 10 per cent above the previous high of 262 attained in February, and 153 per cent above March, 1940. The index has remained above the 200 mark for the past six months, excepting only November when it stood at 173. Previous to the expansion of sales evident in the past two quarters as a result of the heavy mechanized defense program, the all-time high for the period since 1928 had been in March, 1937, when the index was 195. Average index for the first quarter of 1941 was 270, record high comparing with 118 in 1940. Averages for the comparable periods in 1929 and 1937 were 128 and 157 respectively.

Used Tool Offering Prices To Exclude Extras

Washington

• • • **To clarify a portion** of the price schedule established Feb. 17 for second-hand machine tools, the Price Stabilization Division last week instructed dealers to include the name and address of purchasers with their sales reports made to the division. At the same time the division advised dealers that the offering price of a used machine tool must be exclusive of "extras."

The clarification was in the form of an amendment to the original price schedule. The amendments provide:

"1. Hereafter, every report of the sale of a used machine tool must include the name and address of the purchaser. This information need be noted on only one of the two sales reports which the dealer is required to fill out within one week of the transaction. Dealers are warned that the Division may make requests for invoices at any time.

"2. Dealers are instructed that the offering price of a used machine tool must be the offering price of the basic tool exclusive of extras, which are defined as supplementary material furnished by the manufacturer at an added cost. The extras must be listed separately, in the reports which dealers make to the Price Stabilization Division. Second-hand extras are subject to the same maximum price percentage which is applicable to the basic tool to which the extras are added."

Cleveland-Cliffs Iron Co. 1940 Profit $4.3 Millions

Cleveland

• • • **Net profit for the** Cleveland-Cliffs Iron Co. for 1940 totaled $4,382,079, less provision for federal taxes on income, according to the company's annual report. The company reported shipments of iron ore last year from northern properties owned or operated by the company, including those leased to others, amounted to 6,180,197 tons or 9.61 per cent of the total shipped down the lakes. The coal department handled 4,395,277 tons in 1940, up 26 per cent from the 1939 figure.

U. S. Tin Supply Is Reported At 15 Months

Chicago

• • • **A 15 months' supply** of tin is on hand today, the American Management Association was told here by Dr. R. W. Pilcher, American Can Co. research department. But at the same meeting E. Vogelsang, OPM consultant on tin, warned the audience not to expect a free supply of tin during the coming months. Dr. Pilcher said tin stocks were enough to last more than a year despite greater use of hot-dipped tin plate, and effect of the war on tin supplies in the Far East. In 1940 the United States imported 120,000 long tons of tin and consumed 85,000 tons. With about 100,000 tons on hand, he estimated 1941 consumption between 70,000 to 75,000 tons. Pilcher doubted that war would prevent all tin shipments and asserted that tin reclamation possibilities have hardly been scratched.

Vogelsang said that large scale tin reclamation would be uneconomic owing to cost of removing tin to reclamation plants and the fact that only 15,000 tons a year could be reclaimed. Vogelsang also warned that the OPM was not encouraging increased use of tin or its employment as a substitute for other metals. The use of lead foil would be preferable in packaging now instead of tin foil.

Finished Shipments of U. S. Steel Set All-Time Record

• • • **Finished steel shipments** by subsidiary companies of U. S. Steel Corp. in March were the highest in history. March deliveries, totaling 1,720,366 net tons, were one per cent higher than the previous high of 1,701,874 tons set in May, 1929, and 11 per cent above February. Shipments in March, 1940, 931,905 tons, were exceeded by 85 per cent. For the first quarter of 1940, shipments totaled 4,951,271 tons, as compared with 3,086,753 tons in the corresponding period of 1940, an increase of 60 per cent.

Final Contract Let For Studebaker Engine Plant

Fort Wayne, Ind.

• • • **Final contract for** remainder of construction work on Studebaker's aviation engine plant here, has been awarded to Consolidated Construction Co., Chicago. The contract covers completion of three buildings—the main plant, industrial relations building and chip house—as well as miscellaneous installations in these. The following subcontractors will handle these installations: M. J. Corboy Co., Chicago, plumbing; Hickey, Shaw & Winkler, Detroit, heating; Blaw-Knox Co.'s sprinkler division, Chicago, sprinkler systems. Electrical contract went to Hatfield Electric Co., Inc., Indianapolis. Final contracts for two other plants being built by Studebaker at Chicago and South Bend are to be awarded shortly. The three plants will cost $49,700,000, employ 9400 and manufacture high-powered Wright aeronautical engines for the War Department.

Trade Notes

Purchase of the propeller manufacturing business of the Hyde Windlass Co., Bath, Me., in stock motor boat propellers up to 50 in. diameter has been announced by the Federal Mogul Corp., Detroit. The transfer of propeller stock, patterns and designs and rights to manufacture, sales and service of Hyde propellers, makes the Federal Mogul Co. the world's largest manufacturer of motor boat propellers, it is claimed.

•

Anderson Valve Corp., Jones Law Building, Pittsburgh, has opened a New York office at 295 Madison Avenue.

•

Gardner S. Gould, president, Fitchburg Grinding Machine Corp., announces the purchase by his company of a factory on Falulah Road, Fitchburg, formerly occupied by the file manufacturing department of Simonds Saw & Steel Co. All departments of Fitchburg Grinding will be in full operation at the new address by May 1.

•

Gisholt Machine Co., Madison, Wis., has announced the appointment of The Mine & Smelter Supply Co., Denver, as its exclusive sales agent in the Rocky Mountain region.

•

Lamson & Sessions Co., Cleveland, has purchased the machinery and stock of nuts and steel of the semi-finished nut department of Sherman-Klove Co. E. L. McDonough, of that company, will represent Lamson & Sessions with his old customers.

•

New distributors to handle the mechanical goods line of The B. F. Goodrich Co. are: Industrial Service Co., Decatur, Ga.; J. A. McCoy, Des Moines, Iowa; Transmission Supply Company, St. Louis; Lovett & Tharpe Hardware Co., Dublin, Ga.; and Industrial Rubber Products Co., Wheeling, W. Va.

•

Steel Products Sales Corporation, 52 Vanderbilt Avenue, New York, has been appointed New York representatives of the Downingtown Mfg. Co., Foundry Division, Downingtown, Pa.

•

Enterprise Machine Parts Corp., Detroit, has bought the Milholland patent rights and is now building these unit mechanisms and marketing them under the name "Empco." Empco Units lend themselves to drilling, milling, tapping, reaming, and spotfacing (either singly or in multiples) and are used to form machines for speedy production.

•

Universal Gear Corp., Indianapolis, announces appointment of J. F. Johnson and associates as district representatives for western New York, including the Buffalo and Syracuse areas, in full charge of the company's activities in that locality, with offices at 707 Dun Building, 110 Pearl Street, Buffalo.

•

Stockholders of McKeesport Tin Plate Corp. have voted to change the name of the company to National Can Corp.

Allied Engineering Division, Ferro Enamel Corp., Cleveland, has begun building a new circular kiln for the Bengal Potteries, Ltd., of Calcutta, India.

•

Michigan Products Co., Michigan City, Ind., is moving its equipment and about 20 key employees to Sheboygan, Wis., and will occupy the building formerly used by the Jenkins Machine Co.

•

Mid-City Foundry Co. has been organized in Milwaukee by Henry J. Ball, Michael Schneider and Clarence S. Wieland. Offices are with Affeldt and Lichtsinn, Brumder Bldg., Milwaukee.

•

Alabama Marine Engine Co. has been organized at Birmingham, Ala., with R. C. Stobert, president and treasurer; George M. Morrow, Jr., vice-president and W. F. Tynes, vice-president and secretary. The new company has received a contract from the United States Maritime Commission for the construction of 12 steam engines of 2500 hp. for standard cargo ships under the preparedness program.

•

Great Lakes Carbon Corp. has moved its New York City office to 22 East 40th Street.

•

Joseph Satin Co. has moved to larger quarters at 78 John Street, Brooklyn, N. Y.

•

Mercoid Corp., control systems, has removed its New York office to room 1307 Equitable Life Building, 393 Seventh Avenue.

Writer Views Ford Strike Plant Damage

Detroit

• • • **Approximately 20,000** of the 85,000 Ford Motor Co. workers in the Rouge plant returned to work Monday as the plant started to reopen under terms of the truce reached Friday afternoon between Ford executives and the United Automobile Workers (CIO). It is expected that it will taken 10 days or two weeks to get the plant back on its normal operating basis.

Meanwhile, preparations are being made by the company and the local office of the National Labor Relations Board for an election to determine the collective bargaining agent for Ford workers. It is expected to take nearly a month to get the election machinery set up. Two weeks of that time will be occupied in preparing a payroll list to determine those workers eligible to vote. The election probably will be held about two weeks after the eligibility list is furnished. Analysis of the terms of the Ford strike settlement offered little basis for determining who won the strike.

Prior to settlement of the strike this writer (W. F. Sherman) had the opportunity to tour the Rouge after wedging through the lines of pickets, State Police and Ford service men.

The deliberate sabotage, which the company said was attributable to strikers, did not amount to much in number of instances nor in costliness. The outstanding case was in the tool and die shop where, it was claimed, strikers broke windows and entered the building, then damaged some of the equipment being prepared for the aircraft engine plant which Ford is directing and tooling. This included heavy damaging blows to the indicator and calibrating wheel of a Tinius Olson crankshaft balancing machine; the smashing of the dial face of a Rockwell hardness tester, scratches on four surface plates about 3 x 4 ft. in size, smashing the dial face of a Toledo scale, etc. These instances numbered about half a dozen. Strikers also smashed down the door of the tool and die shop by driving a truck against it, it was claimed. Other instances of deliberate damage included slashing the seats on some automobiles and blitz buggies and cutting 600 or 700 strands of cords in the tire plant.

Probably the most extensive repairs required will be those caused by neglect of the open hearth furnaces. Here the principal damage was caused by the backfiring of the No. 10 furnace, a tilting type with a capacity of about 400 tons, that is used principally for mixing hot metal. This furnace had about 180 tons in it ready for tapping when the strike was called and strike leaders refused to permit workmen to tend the furnace until it had backfired onto the charging floor. Then the furnace was tilted forward and broke through on the other side, spilling its contents.

Altogether, about five of the 10 furnaces appeared to have suffered considerable damage to the wall, roof and bottom. The No. 6 furnace is in particularly bad shape, with about 70 tons of solidified steel in it. Other instances of strike-generated carelessness occurred in the tool and die shop where Ingersoll horizontal boring and milling machines were stopped without regard to possible damage to equipment. One was stopped, for instance, with the cutter deep in the slot and the plant management feared that the spindle might be bent or damaged when they attempt to back the tool out of the cut. Several examples of this sort of carelessness were pointed out by company representatives.

Aerial Torpedos to Be Made At Detroit

Detroit

• • • One of the independent automobile companies is preparing to start a tool design program to manufacture aerial torpedos for the British. This work has been subcontracted on a widespread basis and involves the manufacture of a new type projectile to be launched from airplanes in flight and driven by its own power plant against an enemy objective. Production on the item will not start until next fall.

Explosion Cuts Output at Three Blast Furnaces

Birmingham

• • • **An explosion in** a cold blast main at Woodward Iron Co., April 11, took the lives of three workmen, injured nine others and caused the shutdown of Woodward's three blast furnaces, one for an indefinite period.

The explosion in the main, leading to one of the blast furnaces, wrecked two blowing engines and tore the roof off the building housing the engines.

A statement by H. A. Berg, Woodward president, said in part:

"One of our furnaces will be repaired and put back into condition, perhaps in 48 hr. One other will be back in commission in a week. As to the third furnace, it is indefinite as to how long it will be out of commission. It is, of course, difficult to obtain material, which will cause delay to the blast furnace."

E. P. Guinane, agent in charge of the Federal Bureau of Investigation's office here, asserted evidence did not indicate sabotage but investigation would be continued, he said.

Woodward, one of the district's largest iron producers, has been operating at capacity for months supplying material to companies holding defense orders.

Kennametal Shipments Tripled

• • • **Shipments of Kennametal** carbide tools and blanks were three times as great in March, 1941, as in October of last year, Philip M. McKenna, head of the McKenna Metals Co., Latrobe, Pa., reports. Plans for expansion will again double the plant's production by June. The entire productive capacity of the plant will be devoted to the manufacture of the steel-cutting grades of Kennametal, needed for machining airplane motor parts, tank parts, rifle barrels, and shells. Manufacture of the new cast iron cutting grade of Kennametal will be deferred for six months, Mr. McKenna said.

U.S. Steel Lifts Pay 10c., Reaffirms Open Shop

Pittsburgh

• • • **Following negotiations** lasting more than five months, U. S. Steel Corp. subsidiaries and the Steel Workers' Organizing Committee this week reached new agreements calling for a 10c. an hour wage increase, making the base labor rate 72½c. an hr. The agreement provides a vacation plan calling for one week's vacation to employees with three years' continuous service and two weeks' vacation for employees with 15 years' continuous service, a substantial change in the adjustment of grievances, and time and a half pay for employees in other than continuous operation jobs who are required to work on the Fourth of July, Labor Day, and Christmas.

In the new contract, which continues indefinitely but includes the 20 day "escape clause" which was carried in the 1937 contract, there is no provision for exclusive bargaining agent or for any machinery for the collection of dues. Carnegie-Illinois Steel Corp., in its statement, reaffirmed the open shop policy of U. S. Steel and specifically said, "The agreement continues the 'members only' provision of the 1937 contract and makes no provision for the closed shop or dues check-off."

Before Big Steel signed its new contracts with the SWOC, Bethlehem Steel Corp. informed its employees that it was raising wages 10c. an hour with adjustments also to be made to white collar employees. The 10c. an hr. move begun by E. T. Weir, National Steel Corp. board chairman, a week ago is expected to be industry-wide. Republic Steel Corp., Youngstown Sheet & Tube and Otis Steel Co. also advanced wages 10c. an hr.

Allegheny Ludlum also increased salaries 10 per cent. American Rolling Mill Co. called its increase "a defense bonus."

U. S. Steel which, through all its subsidiaries, has signed or will sign the new agreements with the SWOC, will grant the increase to approximately 240,000 wage earners and the cost is estimated at $54,000,000 a year. Bethlehem's announcement is expected to affect 90,000 employees, Republic's 50,000, and Youngstown Sheet & Tube's 25,000.

All wage increases are retroactive to April 1 and it is definite that salaried employees, at least up to a certain figure, which in the case of one company was $4,000 a year, will share a salary increase.

Not part of the SWOC agreement but presented as a memorandum was the action of Carnegie-Illinois Steel Corp. in placing woman workers on the same base rate as men. A typical instance of the change in this case would be a raise from $4.72 a day to $5.80 a day on a certain type of work performed by girls.

In the new contract with the union, U. S. Steel management will clarify the term "employees" by furnishing a list of positions excluded to the union at each plant within 60 days. Any dispute over these questions will be subject to grievance machinery.

Under the old contract with the union, the company stipulated that five days' consecutive work in any calendar week constituted a week's work. Under this system it was possible to schedule a man for 10 consecutive days and not violate this part of the contract. In the new contract five consecutive days' work is to be followed by two consecutive rest days within seven consecutive days in what is classified as a "normal work week." Management, however, reserves the right to establish schedules departing from this intent. Mutually satisfactory modified schedules can be arranged upon request through joint action of the grievance committee and the management. Both parties agreed that not less than 85 per cent of all employees should be scheduled on a normal work week.

Two hours' compensation is also provided for employees reporting for work but sent home for lack of work while employees who start to work but are sent home before the end of 4 hr. shall be paid for at least four hours.

On the question of grievance adjustment, procedure has been established, indicating with clarity each step that can be taken, looking towards final disposition of each grievance. A maximum time limit has been set for the disposition of each grievance and in event both sides cannot mutually agree on the disposition, it becomes mandatory to submit the grievance to arbitration.

U. S. Steel subsidiaries and the union broke new ground on rate establishment and adjustment. The section dealing with adjustment of wage rates provides that rates fixed under the wage section of the agreement cannot be changed except by mutual agreement. In all cases of changing technology which necessitates a change in rate, the agreement provides that changes of this kind made in absence of mutual agreement, may be carried through the grievance procedure to an umpire for determination as to whether the change represents a violation of the wage section, and further, whether the new rate correctly considers the added employee effort, if any.

12% Wage Rise to Cost U. S. Steel $62 Million

• • • **U. S. Steel Corp. estimates that the direct cost to it of the increase in wages, effective as of April 1, and of the other changes provided for in the labor contracts signed by Carnegie-Illinois Steel Corp. and other subsidiaries with the SWOC will amount to more than $62,000,000 yearly at present rates of operation.**

This amount includes the cost of the extension of the vacation plan provided for in such contracts and the cost of the wage increases to be granted to employees in the coal mining operations and to salaried and clerical employees whose compensation is largely governed by that of wage earners.

Further, the indirect costs to the Steel corporation resulting from this wage increase of approximately 12 per cent on the average will eventually reach a very substantial sum.

A study is now being made to determine what the effect of these heavy additional costs may be upon earnings, prices, etc.

(Cost of the wage increase to the entire steel industry, using U. S. Steel figures as a base, apparently will be about $182,000,000 a year at current operating rates. Loss to the government in federal taxes is estimated at about $120,000,000 yearly.)

Roosevelt Indicates: The Less Said About Strikes the Better

Washington

• • • **President Roosevelt** conferred at the White House last Thursday with Chairman Irving S. Olds and President Benjamin F. Fairless of the United States Steel Corp., following a conference he had the day before with Philip Murray, CIO and SWOC head, but no details of either conference were given out. The conference with the steel executives is said to have covered many things, including steel labor relations, and Steel corporation negotiations with SWOC. It is assumed the matter was discussed, but nothing was given out regarding the effect a 10c. an hour wage increase would have on the necessity of increasing steel prices.

At his press conference Friday, the President was asked if steel expansion was discussed and he said that it was not. The outbreak in the Balkans and its effect on steel demand as well as on the shipping situation are reported to have been discussed also.

When asked what had been discussed at the conference with Mr. Murray, the President's reply was a lot of things.

With reference to the strike situation, Mr. Roosevelt indicated that the less said on the outside the better.

UAW Seeks 10c Pay Advance And Union Shop at G-M

• • • **Heavy pressure** on General Motors Corp. by the UAW-CIO is being directed at obtaining a union shop clause in its next contract with the corporation.

First maneuver on the part of the UAW has been the polling of its local union groups for authorization to the International Union to take a strike vote among General Motors workers.

Eighteen locals of the 76 which have sole bargaining rights in various General Motors plants have staged such "advisory" votes and about 35,000 workers of the 165,000 who would be affected are said to be on record now.

April 20 is the deadline for the 60-day conference period provided in the basic GM-UAW contract and the strike vote probably will be taken by the International if an agreement is not worked out before then.

The union contends that a strike, if it is called, will not affect national defense projects upon which the corporation is now engaged.

In addition to the main contention that it must have a union shop clause, the UAW is seeking a general raise of 10c. an hour, improved grievance machinery, extension of the authority of the impartial umpire, increased payments to draftees and increased vacation allowances.

Nickel, Steel Shortage Serious, Girdler Says

• • • Owing to heavy production schedules it is almost impossible to make prompt deliveries, but with the exception of nickel steels and galvanized products our customers have not suffered for want of steel, T. M. Girdler, Republic Steel Corp. chairman, told stockholders on April 9. The shortage of nickel and zinc, he said, is very serious, and the situation on such alloys as ferro chromium, aluminum and certain silicon materials also is causing concern.

"While it is likely there has been some accumulation of steel inventories, for the most part our non-defense customers have been most helpful both in not asking for unreasonable amounts of steel and in changing compositions to permit the defense program to have the strategic materials," Mr. Girdler said.

Scrap Exports Climb

• • • **Exports of scrap** from the United States rose in February to 74,378 gross tons valued at $1,455,512 from the January trade of 45,055 tons valued at $902,535, according to the Bureau of Foreign and Domestic Commerce. This compares with 234,716 tons at $4,137,635 for February, 1940.

The United Kingdom was the chief purchaser taking 67,876 tons of iron and steel scrap to be followed by Canada with a total of 3037 tons. Shipments to Mexico totaled 1459 tons of iron and steel scrap and 11 tons of tin plate circles.

Tungsten Carbide Tools Seen Escaping Priorities

• • • **Placing of tungsten** products under the Federal general priorities system, along with aluminum and magnesium, etc., probably will not affect the production of tungsten carbide tools, according to W. G. Robbins, president, Carboloy Co., Inc., General Electric subsidiary and major producers of such tools.

If anything, Mr. Robbins said, it will place greater emphasis on the use of tungsten carbide tools since these tools require only a minute proportion of the amount of tungsten needed for conventional cutting tools.

"What is not generally appreciated," Robbins pointed out today, "is that Carboloy and some other types of tungsten carbide tools enable a vast reduction in the amount of tungsten needed for cutting tool purposes. Tungsten is an important alloying element of conventional high speed steel tools—in which it represents about 18 per cent of the weight of the complete tool.

"In Carboloy tools, in contrast, tungsten is used only in making the Carboloy tip—representing a small proportion of the weight of the entire tool. An average Carboloy tool, to begin with, actually contains less than one-fifth the amount of tungsten needed for a high speed steel tool of the same size."

Founders Start Materials Survey

• • • **The Gray Iron** Founders Society is making a national survey to ascertain consumption of all raw materials by gray iron foundries in 1940 and anticipated consumption in 1941, according to W. W. Rose, executive secretary, who not long ago completed at the request of Washington a survey on consumption of scrap rails.

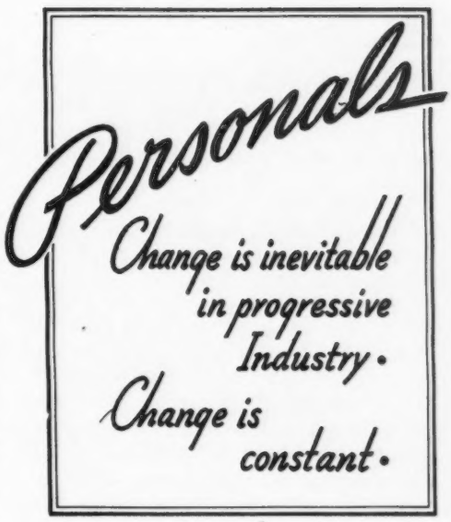
At a combination meeting of officers of the Gray Iron Founders Society and the Warm Air Heating Institute here last Friday the effect of the new iron and steel scrap differentials was examined and a delegation appointed headed by Mr. Rose to go to Washington April 15 with a view toward showing how the new differentials will tend to isolate certain communities which depend on outside source for most of their cast iron scrap.

• **W. H. Pritchard,** for the past five years identified in various capacities in the cost and sales departments of Kearney & Trecker Corp., Milwaukee, has been appointed assistant purchasing agent.

• **Roy E. Greenwood,** heretofore Chicago district sales manager of the American Chain Division of the American Chain & Cable Co., Bridgeport, Conn., has been made assistant Pacific Coast manager, with headquarters at 630 Third Street, San Francisco. He will operate under E. O. Johnstone, who has been Pacific Coast manager for many years. **E. J. Flood** will succeed Mr. Greenwood as district sales manager for the Chicago territory of the American Chain Division, and will continue as district sales manager of Page Steel & Wire Division.

• **H. A. H. Pray,** a member of the staff of Battelle Memorial Institute since 1934, has been named head of a new division of electrochemical research at Battelle. Previous to 1934, Dr. Pray held professorships at several universities.

• **Robert H. Ahlers,** general plant manager of the Pontiac Motor Division, Pontiac, Mich., for the past four years, has been put in direct charge of all defense work. The



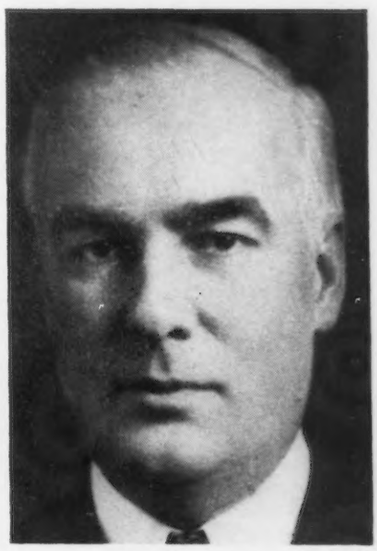
appointment was made following an announcement by the Navy Department that the Defense Plant Corp. will spend up to $5,700,000 for machinery and equipment to manufacture Navy ordnance materiel at Pontiac. **Buell Starr,** now assistant superintendent of the motor plant, will become defense plant superintendent with **Robert Blackinton,** chief tool engineer, becoming master mechanic. **Stanley Baughman** will be standards engineer and **Fred Maltbie** head of the defense design department. **Paul Gaugh,** inspector in the Pontiac axle plant, takes over defense inspection. **W. L. Kelly,** night superintendent of the Pontiac sheet metal plant, will be night superintendent of the defense plant. **Stanley Dotson,** head of material supervision in the motor plant, will have the same duties on defense and **Leonard J. Redford** will be in charge of defense purchases. **Ivan H. Long** will head the personnel department and **W. T. Jones,** assistant comptroller of Pontiac Motor Division, will become comptroller of defense work.

• **Paul Lyon** has been appointed assistant manager of the galvanized sheet and roofing sales division of Wheeling Steel Corp., Wheeling, W. Va. Mr. Lyon joined the organization several years ago and has been identified with the tin plate sales division. **D. L. Irvine** has been named assistant manager of the tin plate sales division. He will move to Wheeling from Chicago where he was in the Chicago district office in a sales capacity. **I. J. Koehnline,** who has been connected with the lithographing division of the tin plate sales division for some years, has also been appointed assistant manager of the tin plate sales division.

• **B. J. Brugge** has been appointed by the Lincoln Electric Co., Cleveland, as its welding consultant and engineer at Washington. He

W. H. PRITCHARD, assistant purchasing agent, Kearney & Trecker Corp., Milwaukee.

ROY E. GREENWOOD, assistant Pacific Coast manager, American Chain Division of the American Chain & Cable Co., Bridgeport.



E. J. FLOOD, Chicago sales manager of American Chain Division and district sales manager of Page Steel & Wire Division.

H. A. H. PRAY, supervisor of electrochemical research, Battelle Memorial Institute, Columbus, Ohio.

will be associated with T. A. Canty, Inc., Lincoln's representative in Baltimore, and will be available to all governmental departments. A graduate of Purdue University, he began his career in arc welding with two years in the Lincoln research laboratory. In 1935 he was granted a leave of absence to serve as welding superintendent for the Anglo-Iranian Oil Co.

ROBERT H. AHLERS, general plant manager in charge of defense work of Pontiac Motor Division.

• **J. K. Beeson,** whose election as vice-president in charge of sales of the Pittsburgh Steel Co., Pittsburgh, was announced in these columns recently.

• **Louis Poock,** president and general manager of the new Sheffield Corp., Dayton, Ohio.

• **J. E. Skinner** has been placed in charge of welding wire sales as assistant to W. H. Bleecker, sales manager, at the general sales office of Page Steel & Wire division, American Chain & Cable Co., Inc., Monessen, Pa., replacing W. H. Godfrey who was recalled to active duty with the United States Navy. W. G. Hoagland of the Chicago office of the Page Steel & Wire division has been transferred to Monessen to take over Mr. Skinner's former duties.

• **William Whigham, Jr.,** supervisor of organization planning since 1938, has been appointed chief of wage and salary administration, Carnegie-Illinois Steel Corp., Pittsburgh. Mr. Whigham began his career with subsidiaries of U. S. Steel Corp. at the Clairton by-product coke works of the former Carnegie Steel Co. in 1919. He served at various operating positions and later was in charge of the engineering test department. He was made assistant chief engineer in 1926 and master mechanic in 1928. In 1930 he joined the Dravo Contracting Co. as manager of marine repairs and outfitting. Returning to Clairton works in 1933 as superintendent of maintenance, he later organized and served as chairman of the company's maintenance committee. In addition to these responsibilities, Mr. Whigham served concurrently as superintendent of industrial relations and as a member of the Carnegie-Illinois committee for installation and development of apprentice and supervisory training.

• **Frederic R. Henderer** has been appointed chief of safety of the Carnegie-Illinois Steel Corp. He has been associated with the U. S. Steel subsidiary since 1935 and has been chief of training since October, 1940. Mr. Henderer began his association with subsidiaries of U. S. Steel as a civil engineer with Illinois Steel Co.

Obituary

• **Cecil Swan,** who was vice-president in charge of sales at the Detroit Lubricator Co. and who had been associated previously with the American Radiator Co. and the Standard Sanitary Corp., died recently in Detroit. He was born in Elmira, N. Y., 60 years ago and had lived in Detroit for the past 15 years.

• **William Remsen Appleby,** founder and since 1935 dean emeritus of the Minnesota School of Mines, died at Newton Center, Mass., April 8. He was in charge of the party that examined coal and iron properties and operations of the South Manchurian Railway in 1921. He was born in Hoboken, N. J., 76 years ago.

• **Martin J. Dowling,** founder, president and treasurer of the Atlantic Stamping Co., Rochester, N. Y., died April 4, aged 64. Mr. Dowling, who founded the company 35 years ago, was born in Livonia, N. Y.

• **Walter J. Henry,** vice-president of the Boston Gear Works, died recently. He was born in Boston 43 years ago, was graduated from the Massachusetts Institute of Technology, and was associated with the Pittsfield, Mass., plant of the General Electric Co., and the Henry & Wright Co., Hartford, Conn., as electrical engineer before he went to Quincy, Mass., to become an executive of the gear works.

• **Blaine Seuver,** chairman of the board of Enterprise Aluminum Co., Massillon, Ohio, died in Palm Beach, Fla., April 8. He was 56 years old.

• **William G. Schenk,** chief engineer for the Plankinton Packing Co., Milwaukee, for more than 26 years and in charge of the safety division, died April 9 at his home in Milwaukee at the age of 56.

• **H. H. Neel,** who was for 30 years a steel salesman in New York and Philadelphia, and who had for some time been with the Alan Wood Steel Co. in its New York office, died on April 1.

Metal Working Activity

. . . Latest Data Assembled by The Iron Age
From Recognized Sources. In Net Tons.

	Feb. 1941	Jan. 1941	Feb. 1940	12 Months 1940	12 Months 1939
Steel Ingots:					
Monthly output[a]	6,250,413	6,943,084	4,527,141	66,993,219	52,798,714
Average weekly output[a]	1,562,603	1,567,288	1,093,512	1,281,431	1,012,634
Per cent of capacity[a]	96.8	97.1	70.0	82.1	64.7
Pig Iron:					
Monthly output[b]	4,197,872	4,663,695	3,311,480	46,948,906	35,317,374
Raw Materials:					
Coke output[c]	4,998,491	5,446,989	4,172,042	56,747,585	44,425,123
Lake ore consumed[d]	6,353,946	7,090,740	4,750,860	69,917,472	49,684,644
Scrap iron consumed	4,673,000	4,794,000	3,420,000	46,689,000	39,207,000
Castings:					
Malleable, orders[e]	76,055	81,089	34,901	571,929	489,482
Steel, orders[e]	105,125	110,579	40,913	816,919	685,074
Finished Steel:					
Trackwork shipments[a]	7,973	6,835	6,898	79,539	68,663
Fabricated shape orders[f]	159,815	266,594	98,882	1,748,144	1,305,049
U. S. Steel Corp. shipments[g]	1,548,451	1,682,454	1,009,256	14,976,110	11,707,251
Fabricated Products:					
Automobile production[h]	485,523	500,931	404,032	4,469,354	3,577,292
Steel furniture shipments[e], value	$3,368,019	$3,152,013	$2,263,969	$29,759,591	$22,609,168
Steel boiler orders[e] (sq. ft.)	1,543,821	2,210,047	558,108	17,233,295	11,098,316
Locomotives ordered[i]	127	78	13	677	415
Freight cars ordered[i]	5,645	14,118	2,748	64,871	56,915
Foundry equipment index[k]	281.1	285.3	135.7	183.7†	*
Gear sales index	262	259	116	155†	103†
Non-Ferrous Metals: (U. S. only)					
Lead shipments[l]	54,852	55,707	39,176	603,143	555,074
Lead stocks[l]	46,604	47,248	72,658	.....	.....
Zinc shipments[m]	59,220	63,272	51,050	696,497	598,972
Zinc stocks[m]	4,962	8,768	65,869	.....	.....
Tin deliveries[n]	13,658	14,291	7,392	129,357	80,523
Refined copper deliveries[o]	112,808	119,736	63,215	1,001,886	814,407
Refined copper stocks[o]	97,689	116,854	145,393	.....	.....
Exports:					
Total iron and steel[p]	.....	782,715	751,857	11,881,663	6,805,600
All rolled and finished steel[p]	.....	316,493	353,095	4,590,734	2,109,527
Semi-finished steel[p]	.....	312,432	95,061	3,310,718	368,360
Scrap[p]	.....	50,462	261,714	3,161,859	3,977,780
Imports:					
Total iron and steel[p]	.....	474	7,549	64,179	352,980
Pig iron[p]	.....	.....	2,276	11,471	43,223
All rolled and finished steel[p]	.....	342	1,568	14,830	175,512

Sources of data: [a] American Iron and Steel Institute; [b] THE IRON AGE; [c] Bureau of Mines; [d] Lake Superior Iron Ore Association; [e] Bureau of the Census; [f] American Institute of Steel Construction; [g] United States Steel Corp.; [h] Preliminary estimates by THE IRON AGE—Final figures from Bureau of the Census, U. S. only; [i] *Railway Age*; [j] National Machine Tool Builders Association; [k] Foundry Equipment Manufacturers Association; [l] American Bureau of Metal Statistics; [m] American Zinc Institute; [n] New York Commodity Exchange; [o] Copper Institute; [p] Department of Commerce; [r] Institute of Scrap Iron and Steel; [s] American Gear Manufacturers Association.

* Not available. † Monthly averages.

The Iron Age Comparison of Prices

Advances Over Past Week in Heavy Type; Declines in Italics

	Apr. 15, 1941	Apr. 8, 1941	Mar. 18, 1941	Apr. 16, 1940
Flat Rolled Steel:				
(Cents Per Lb.)				
Hot rolled sheets	2.10	2.10	2.10	1.90
Cold rolled sheets	3.05	3.05	3.05	2.85
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	1.90
Cold rolled strip	2.80	2.80	2.80	2.60
Plates	2.10	2.10	2.10	2.10
Tin and Terne Plate:				
(Dollars Per Base Box)				
Tin plate	$5.00	$5.00	$5.00	$5.00
Manufacturing ternes	4.30	4.30	4.30	4.30
Bars and Shapes:				
(Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Wire and Wire Products:				
(Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails:				
(Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel:				
(Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs	34.00	34.00	34.00	34 00
Forging billets	40.00	40.00	40.00	40.00
Wire Rods and Skelp:				
(Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp (grvd)	1.90	1.90	1.90	1.90

	Apr. 15, 1941	Apr. 8, 1941	Mar. 18, 1941	Apr. 16, 1940
Pig Iron:				
(Per Gross Ton)				
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$24.84
No. 2, Valley furnace	24.00	24.00	24.00	23.00
No. 2, Southern Cin'ti	24.06	24.06	24.06	23.06
No. 2, Birmingham	20.38	20.38	20.38	19.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	23.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	24.34
Basic, Valley furnace	23.50	23.50	23.50	22.50
Malleable, Chicago†	24.00	24.00	24.00	23.00
Malleable, Valley	24.00	24.00	24.00	23.00
L. S. charcoal, Chicago	30.34	30.34	30.34	30.34
Ferromanganese‡	120.00	120.00	120.00	100.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton. ‡For carlots at seaboard.

Scrap:				
(Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$21.00	$16.25
Heavy melt'g steel, Phila.	18.75	18.75	20.00	16.75
Heavy melt'g steel, Ch'go	18.75	18.75	20.00	15.25
Carwheels, Chicago	....	....	....	20.25	16.75
Carwheels, Philadelphia	....	....	23.00	20.25
No. 1 cast, Pittsburgh	23.25	....	23.25	17.75
No. 1 cast, Philadelphia	24.00	23.75	24.50	20.25
No. 1 cast, Ch'go*	*22.60	*22.60	21.25	14.75

*Changed to gross ton basis.

Coke, Connellsville:				
(Per Net Ton at Oven)				
Furnace coke, prompt	$5.625	$5.625	$5.50	$4.00
Foundry coke, prompt	6.25	6.25	5.75	5.25
Non-Ferrous Metals:				
(Cents per Lb. to Large Buyers)				
Copper, electro., Conn.*	12.00	12.00	12.00	11.50
Copper, Lake, New York	12.00	12.00	12.00	11.50
Tin (Straits), New York	52.125	51.75	52.25	47.25
Zinc, East St. Louis	7.25	7.25	7.25	5.75
Lead, St. Louis	5.70	5.70	5.60	4.95
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

*Mine producers only.

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 107-116 herein.
On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

Composite Prices

	FINISHED STEEL	PIG IRON	SCRAP STEEL
April 15, 1941	2.261c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.261c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.261c. a Lb.	$23.61 a Gross Ton	$20.33 a Gross Ton
One year ago	2.211c. a Lb.	$22.61 a Gross Ton	$16.08 a Gross Ton

	High	Low	High	Low	High	Low
1941			$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.261c., Jan. 2	2.211c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.286c., Jan. 3	2.236c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.512c., May 17	2.211c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.512c., Mar. 9	2.249c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.92, Nov. 10
1936	2.249c., Dec. 28	2.016c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.062c., Oct. 1	2.056c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.118c., Apr. 24	1.945c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.953c., Oct. 3	1.792c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.915c., Sept. 6	1.870c., Mar. 15	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.981c., Jan. 13	1.883c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.236c., May 28	2.192c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08. Dec. 3

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

Summary of the Week

• 10c. per hr. wage increases may be followed by some compensating price advances . . . Coal strike affecting pig iron and steel production and situation may become worse . . . Tighter government controls foreshadowed by creation of new price administration.

THE 10c. per hr. wage increase granted on April 14 by the United States Steel Corp. and the Bethlehem Steel Co. and immediately adopted by several other steel companies may be followed by price advances on some products to offset the higher direct and indirect labor costs.

It is significant that a statement issued by Chairman Irving S. Olds of the U. S. Steel Corp. coincident with the wage announcement said that "a careful study is now being made to determine what the effect of these additional heavy costs may be upon earnings, prices, etc., of the Steel corporation."

If there are to be price advances, products which may be left untouched are rails and tin plate, both of which are sold on long-term arrangements. There have been some price adjustments within the past week, notably on galvanized products, in which the zinc shortage is a factor. Galvanized pipe is up $6 a ton and the extra on galvanized nails has been raised 25c. per 100 lb. A reclassification of cold rolled strip extras places some gages on commodity strip on a higher level.

ON the basis of last year's earnings, which for the entire industry were about $300,000,000, some of the higher cost producers will barely break even with the added labor costs, while the fully integrated and lower cost producers will show great reduction of profits unless there are compensating price increases.

While a steel strike has been averted by the wage increases, the outlook for uninterrupted production is impaired by continuance of the shutdown of bituminous coal mines. Three blast furnaces of the Carnegie-Illinois Steel Corp. have been banked because of coke shortage, one Republic furnace at Youngstown has been prematurely blown out for relining, and two other furnaces in the Valleys are precariously short of coke and may be forced out this week. Even if coal mining is resumed this week, it may be too late to avert further shutdowns because beehive coke drawers are on strike and coke has not been drawn from the ovens. There might be a further loss of production for a week or 10 days.

Ingot production has suffered a setback in the Pittsburgh district as a result of the coke situation. The rate there is off three points to 99 per cent. At Chicago, however, a new high of 102 per cent was attained. Ford steel furnaces will resume at mid-week after the strike at that plant. The average rate of the industry is down a half point this week to 98.5 per cent.

Notwithstanding that some steel companies can take very little additional business for delivery this year and that some are declining to take business for 1942, new bookings are running ahead of the March tonnage which was a record-breaker for many producers. In addition to an increasing volume of defense business, which is displacing some commercial steel tonnage, railroad equipment buying has increased sharply, totaling 8600 cars and 31 locomotives, and tin plate business is running at a rate which is expected to exceed that of last year by 20 per cent. It appears that the crest of the demand for fabricated structural steel for defense plants may have been passed, but in all other departments of steel business the volume is unabated or upward. Among new defense projects is an airplane bomber assembly plant at Tulsa, Okla., which calls for 26,000 tons of structural steel.

TIGHTER Government control over industry, particularly prices, is foreshadowed by the creation of the Office of Price Administration and Civilian Supply, which has been invested by President Roosevelt with broader powers than existed under the Price Administration Division of the National Defense Advisory Commission, which it supersedes. While Price Administrator Leon Henderson's first public statement under the new set-up was to declare against steel price increases, the door is believed to have been left open for the industry to prove by its studies that some increases may be necessary.

The Price Administration has ameliorated the situation on scrap contracts by extending the time limit for their completion to May 10, and may be called upon to iron out some disparities in prices as between districts. The British want 75,000 tons of steel scrap for May shipment and may encounter difficulty in getting it because the formula for export prices does not permit high enough offers to compete with domestic mills near seaboard.

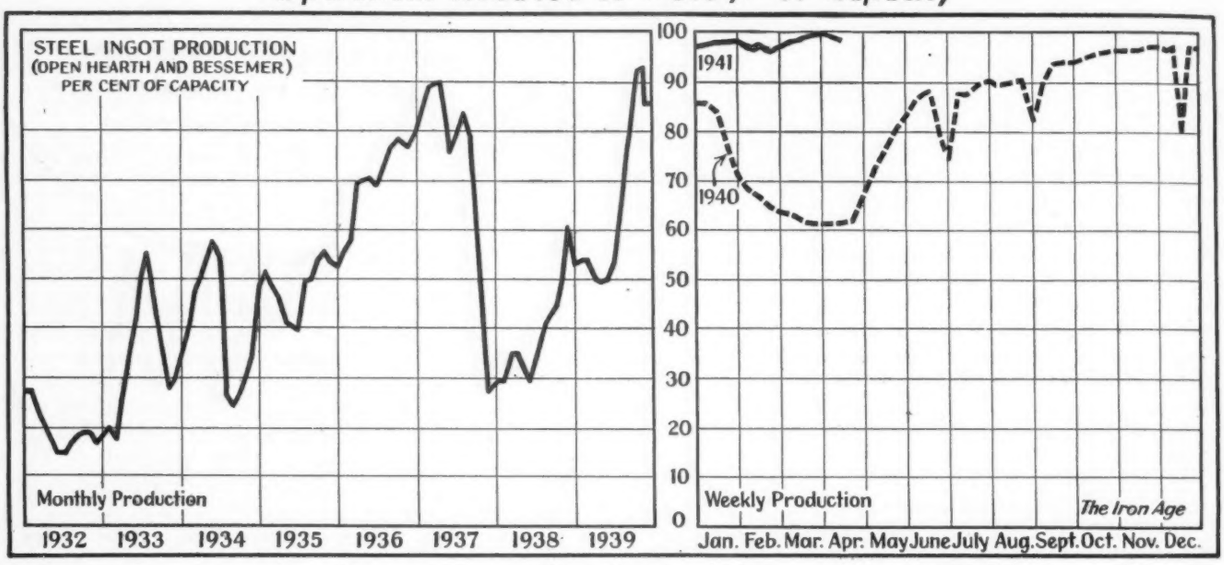
Nickel steels have been placed under strict priority control. Priorities for ship plates are under consideration, but may not be applied immediately as it appears that lack of sufficient heavy forging equipment is a more serious obstacle to ship construction than plates.

The Industrial Pace . . .

DRASTIC CURTAILMENT of activity in the Pittsburgh district, and a sharp contraction of automobile production, due partly to the Ford Motor Co. strike, were the chief factors in the most abrupt loss in THE IRON AGE index of capital goods activity in over two years. The index fell in the past week from 117.0 to 107.7. Direct and indirect results of a stoppage of bituminous coal production led to the loss at Pittsburgh. Automobile output slumped contraseasonally by 15 per cent from 116,255 to 99,260 units after maintaining high levels for the past six months. All other components showed decreases in the week.

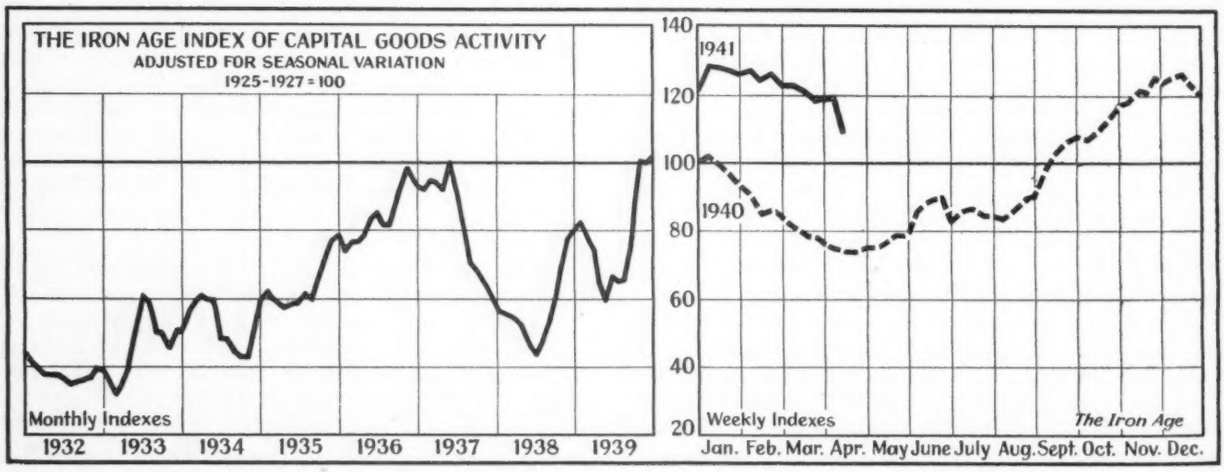
FINISHED STEEL SHIPMENTS by subsidiary companies of the U. S. Steel Corp. reached an all-time peak in March of 1,720,366 net tons, 1 per cent above the previous high in May, 1929, of 1,701,874 tons, 11 per cent above February, and 85 per cent above March, 1940. Heavy engineering construction awards totaled $452,430,000, third highest volume and highest March total on record, comparing with $424,269,000 in February, and $179,836,000 in March, 1940. Iron and steel exports (excepting scrap) declined further in February to 525,862 gross tons, 20 per cent under January, and 20 per cent above February, 1940.

Operations Reduced to 98.5% of Capacity



District Ingot Production, Per Cent of Capacity	Pitts-burgh	Chicago	Valleys	Phila-delphia	Cleve-land	Buffalo	Wheel-ing	Detroit	Southern	S. Ohio River	West-ern	St. Louis	East-ern	Aggre-gate
Current Week ..	99.0	102.0	99.0	96.0	98.0	106.0	85.0	85.0	95.0	109.0	102.5	111.0	95.5	**98.5**
Previous Week..	102.0	101.0	99.0	96.0	99.0	104.5	85.0	73.5	95.0	108.5	102.5	111.0	95.5	**99.0**

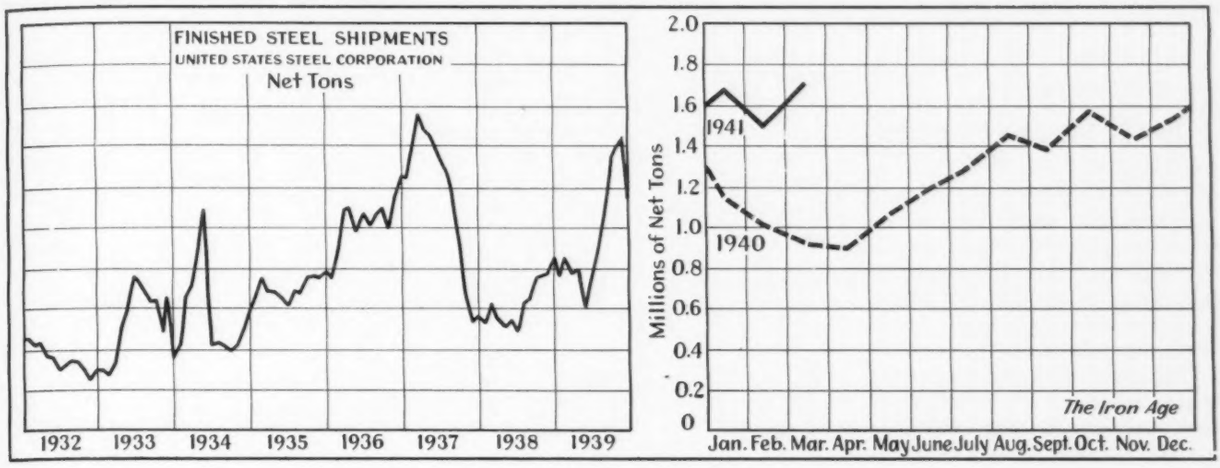
Index Drops Sharply to Lowest Point Since October



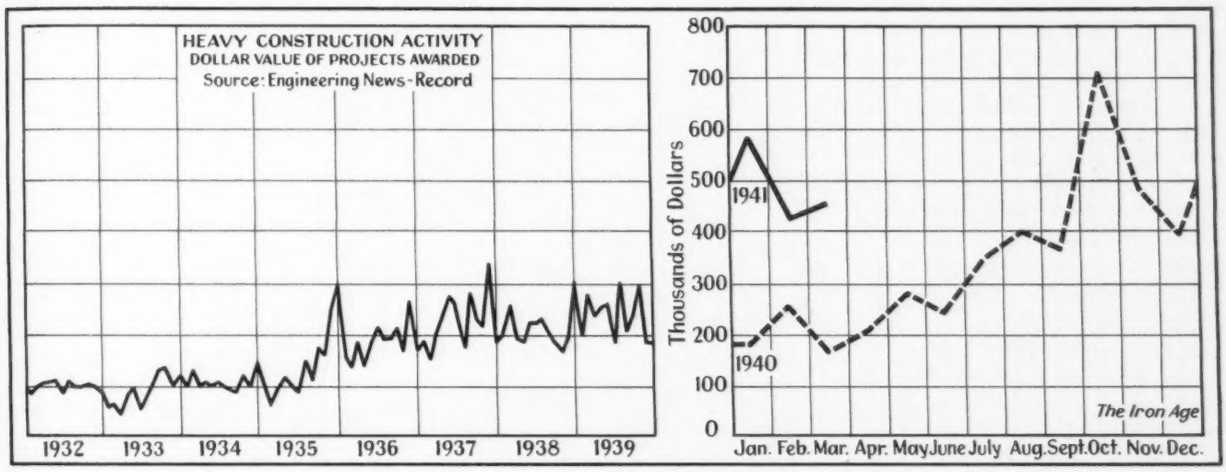
Component — Week Ended ➤	Apr. 12	Apr. 5	Mar. 15	Apr. 13 1940	Apr. 13 1929
Steel ingot production[1]	131.5	132.8	130.3	77.7	123.1
Automobile production[2]	83.2	100.1	124.7	86.3	127.1
Construction contracts[3]	147.5	152.3	158.1	68.5	148.4
Forest products carloadings[4]	69.2	72.1	70.1	56.5	132.7
Pittsburgh output and shipments[5]	106.9	127.8	125.4	85.5	120.0
COMBINED INDEX	107.7	117.0	121.7	74.9	130.3

Sources: [1] THE IRON AGE; [2] Ward's Automotive Reports; [3] *Engineering News-Record*; [4] Association of American Railroads; [5] University of Pittsburgh. Indexes of forest products carloadings and activity in Pittsburgh area reflect conditions as of week ended April 5. Other indexes cover week of April 12.

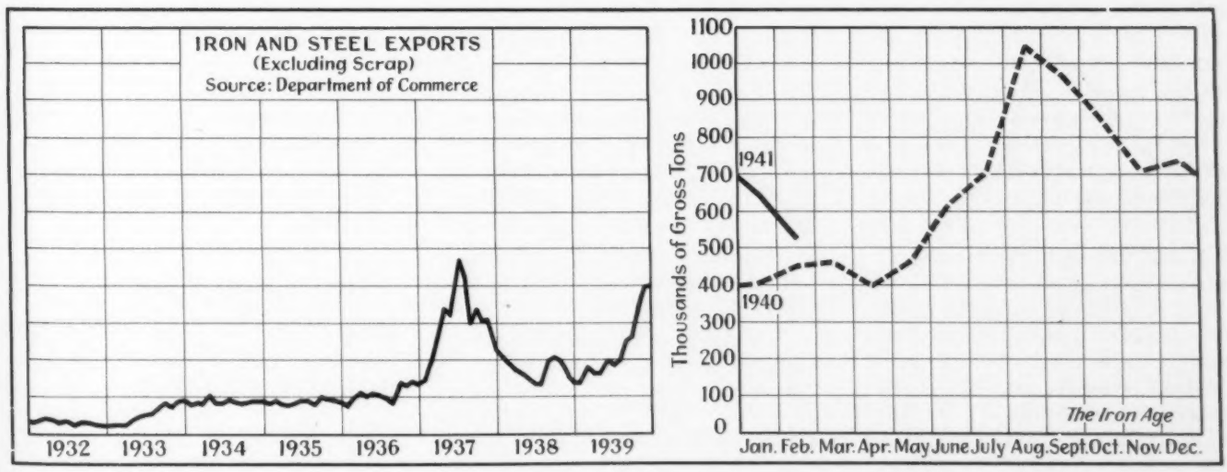
U. S. Steel March Shipments Set All-Time High



March Building Awards Third Highest on Record



Steel Exports Extend Decline 20% in February



Market News

. . . THE WEEK'S ACTIVITIES IN IRON AND STEEL

New Business

. . . April orders exceeding those of record-breaking March

Although March steel bookings at PITTSBURGH rank among the greatest in history, orders so far this month are not much, if any, behind March total for the corresponding period. Deliveries on all products have been further extended and the continual consumer fear, whether unfounded or not, that some supplies may be difficult to obtain later in the year, is still considered to be the main reason for the heavy influx of fresh orders.

The turning down of business for 1942 delivery by some companies has only served to increase pressure on other steel companies which have not taken this stand. Steel business now is definitely one of production and distribution, according to PITTSBURGH makers, and any obstacles, no matter how small, which interfere with these two prime factors, will, in some way, affect the national defense program.

Orders for steel at CHICAGO show no change in volume. Business for April is ahead of March, and that month was a record breaker. Orders carrying preference ratings are increasing in number, making production schedules subject to frequent adjustment. Customers' inventories still decline, now estimated at 15 to 45 days.

Shell programs at CHICAGO loom bigger in the general picture. Shell steel is being shipped with increasing regularity on old orders and huge new orders will be placed within a week to 10 days. Intense activity of warehouses is reflected in the fact that two largest orders received by one mill last week were from houses seeking to replenish depleted stocks.

Demand for steel from transportation fields appears gaining at CLEVELAND. Large inquiries involving railroad equipment, motor truck bodies, pipe lines and shipbuilding have been received recently.

Orders for stainless and other steel with nickel content are being reshuffled following the recent action at Washington.

Because of the scarcity of major products for reasonably early delivery in EASTERN PENNSYLVANIA, a slackening in the volume of new inquiry has been felt there by mills recently. Few consumers are at present interested in deliveries into 1942, while some mills refuse to book orders so far ahead. A stainless producer can offer nothing better than 40 weeks delivery, including straight chromium grades.

Orders placed at BIRMINGHAM during the first half of April are as heavy as those for the corresponding period in March.

Buffalo steel mills report an increased number of defense priority orders and that many commercial orders consequently must be pushed aside. Mills also report that, in addition to defense orders, considerable tonnage has been sought by automotive manufacturers endeavoring to maintain production of 1941 cars at the new production peak established during the first quarter.

Prices

. . . Some advances expected as result of wage rise

With the steel industry committed to a 10c. an hour wage increase, it is believed that, unless some unforeseen development occurs, the industry will be forced to raise steel prices to an extent which will at least partly compensate for the increased wage cost. While the administration was believed to be dead-set against any steel price increases whatsoever, it is likely that the President, in his talks with Messrs. Olds and Fairless of U. S. Steel Corp. and Philip Murray of the CIO, capitulated to the argument that at least a partial adjustment in steel prices would be necessary.

Unless informed opinion is forced to be changed by future events, a complete list of price changes is expected. Such price advances would not likely be substantial and it is believed they would only include amounts necessary to compensate for that portion of the wage increase which cannot specifically be absorbed by operating economies. It is also likely that the amount of the advances, if any, would be dictated from operating data on those items for which the return has not been commensurate with the manufacturing costs involved.

It is not believed that there will be any change in the price of tin plate for the second or third quarter since custom has dictated that the first quarter price of tin plate rules for the first nine months of the year.

It is unlikely that any change will be made in the price of standard rails since railroads are usually assured that orders placed at the end of one year or early in the next year will be delivered throughout the first nine months at the price in effect at the time the order was booked.

It is recalled that when the $5 a day wage rate was established in 1937 steel prices were advanced at that time. However, in June, 1938, prices on all steel products were cut from $3 to $7 a ton, with no compensating decline in the wage rate. The steel industry has had to absorb a fair amount of raw material increased costs and in the case of the U. S. Steel Corp. the present estimated increase in direct wage costs which amounts to $621,000,000 or more a year is understood to have been too great to absorb except by some help in a slightly higher price level. Whether or not the logic expressed in the steel industry on this question will become a fact remains to be seen, but at this writing the probability is that some steel prices will be increased.

Steel Operations

. . . Coke shortage results in a three point drop at Pittsburgh

Thus far the coal strike and consequent shortage of beehive coke has affected mainly the Pitts-

burgh district, where operations have dropped three points this week to 99 per cent, but unless there is a speedy resumption of coal mining the effect will be more widespread. The only other decline this week is at Cleveland, where the rate is off one point to 98 per cent. The rate for the industry as a whole is calculated at 98.5 per cent, a half point below last week.

The Chicago rate has gained a point to 102 per cent, a new high level there. Resumption of some if not all of the Ford open hearths at Detroit will result in a gain in that district, calculated for the calendar week, of 11.5 points to 85 per cent. The Buffalo district is up a point and a half to 106 per cent. This high rate is exceeded in two districts, St. Louis with 11 per cent and Southern Ohio with 19 per cent.

Pig Iron

. . . Production curtailed by coke shortage and explosion

Pig iron production enters a critical phase this week at PITTSBURGH, especially on those cases where operations are supplied by beehive coke. If beehive ovens are pulled this week and the strike has not been settled in time to recharge, relatively serious consequences are expected. Some blast furnaces not already down would have to be banked temporarily. Up to Tuesday of this week, three steel making stacks in that district had been shut down. More were to follow if the strike is not settled promptly.

At YOUNGSTOWN this week, Republic Steel Corp. announced the "growing scarcity of coke" resulted in the premature shutting down of a 650-ton blast furnace for relining. This is one of four blast furnaces at the Youngstown plant and was scheduled to continue operations for several more months before being relined. Since Nov. 26, 1924, when it was last relined, the furnace has produced more than 1,850,000 tons of iron. It will be out of production for approximately 60 days.

At CLEVELAND, emergency inquiries for iron have grown more numerous in the last few days, apparently a reflection of the recent curtailment in output over the country.

On Monday officials of Sharon Steel Corp. indicated that within 48 hr. they would be forced to bank the Mary furnace at Lowellville, unless coke could be secured for its operation.

Anna furnace of Struthers Iron & Steel Co. went into blast last week. A few days' supply of coke was on hand, augmented by additional coke received in exchange for pig iron needed by a Valley steel maker.

E. J. Kulas, president Otis Steel Co., Cleveland, said his company still holds a few days' supply of coal and has not been forced to restrict operations.

"The situation is pretty serious, though," said Mr. Kulas. "Unless we get coal soon we are all going to be up against it."

Youngstown Sheet & Tube Co. was reported to have about three weeks' supply of coal and coke and not in immediate danger.

Iron production at BIRMINGHAM was curtailed last week by an explosion in a cold blast main at Woodward Iron Co. which caused temporary shutdown of two of the company's three furnaces and the shutdown for an indefinite period of the third. Before the explosion occurred, 17 of the district's 18 available furnaces were in blast.

The Hamilton Coke & Iron Co., unit of the American Rolling Mill Co., is producing a small amount of merchant iron on week-end runs, but has not yet gotten to substantial output.

Semi-Finished Steel

. . . Output earmarked over the remainder of year

With all available capacity throughout the remainder of the year earmarked, prime attention in this market is placed on production and distribution. Demand is still outrunning the ability of companies to produce but so far tight spots are the exception rather than the rule. The influx of heavy shipbuilding specifications has laid a heavier response upon makers of plate slabs.

The 24-hr. production schedules at leading forge shops in CLEVELAND are depleting incoming steel shipments quickly and necessitating urgent re-orders which mills often are hard pressed to meet. The sheet bar situation continues to grow tighter and some users face the prospect of further curtailment by third quarter.

Shipbuilding

. . . 302 engines awarded for 312 ships

Contracts have been awarded for 302 of the engines for 312 standardized cargo ships to be built under the emergency program of the Maritime Commission. In making this announcement the commission said that manufacturing plants in many parts of the United States will construct the engines which are of the triple-expansion reciprocating type with an indicated 2500 hp. The contracts provide for delivery of the engines at stated intervals throughout an 18-month period. Contracts are still pending with one or two other manufacturers, it was stated.

Plants to which contracts have been awarded are: Alabama Marine Engine Co., Birmingham, 12 engines; Harrisburg Foundry & Machinery Co., Harrisburg, Pa., 20; Astoria Marine Iron Works, Astoria, Ore., 10; General Machinery Corp., Hamilton, Ohio, 60; Worthington Pump & Machinery Corp., Harrison, N. J., 36; Filer & Stowell Co., Milwaukee, 12; Joshua Hendy Iron Works, Sunnyvale, Cal., 112; Ellicott Machine Corp., Baltimore, 20; Toledo Shipbuilding Corp., Toledo, Ohio, six; Clark Brothers, Olean, N. Y., 14.

Distribution of these contracts has been made in accordance with the policy of the Maritime Commission, it was stated, to tap as many fields of available skilled labor and production facilities as possible without interference with other phases of the national defense program. Under the Emergency Shipbuilding Division of the Commission, there are being constructed the 200 ships included in the original program and the 112 additional authorized by the President for construction for Great Britain. This does not include 60 ships for which the British government has contracted with American shipbuilders.

The original 200 ships are to be constructed on 51 ways in seven new shipyards which are already far along in process of building. The additional 112, according to commission's plans, are to be constructed on shipways to be added.

Railroad Buying

. . . 8600 freight cars and 31 engines ordered

Orders have been placed for about 8600 freight cars and 31 locomotives. Santa Fe bought 1700 freight cars, a 5400-hp. diesel-electric freight locomotive and 22 stainless steel passenger cars. The freight cars were distributed as follows: 1000 50-ton box cars and 500 50-ton auto cars to Pullman-Standard Car Mfg. Co., 200 50-ton mill type gondolas to General American Transportation Corp., and 50 cabooses to be constructed in company's shops. The diesel-electric freight locomotive will be built by Electro-Motive Corp. Passenger cars were placed with the Edward G. Budd Mfg. Co.

Illinois Central ordered 2300 freight cars, costing $7,400,000: 1000 50-ton hoppers from Pullman-Standard, 500 box cars, 200 refrigerator and 100 hopper cars from General American, and 500 40-ton box cars from American Car & Foundry Co.

New York Central placed 1000 box and 1000 gondola cars of 50-ton capacity with Despatch Shops, Inc. These shops are turning out a freight car every 15 minutes.

Erie Railroad has ordered 1600 cars for delivery in August. The order was distributed as follows: 800 box cars to Pullman-Standard, 100 automobile, 100 furniture and 50 covered hopper cars to American Car & Foundry Co., 250 hoppers to General American Transportation Corp., 250 gondolas and 50 flat cars to Greenville Steel Car Co.

Wheeling & Lake Erie purchased 500 50-ton hoppers from American Car & Foundry Co.

Central of Georgia placed an order for 200 freight cars with Pullman-Standard and for two switching locomotives with Baldwin Locomotive Works.

Southern Pacific ordered 50 70-ton gondolas from American Car & Foundry, Bethlehem is building three 200-ton ingot cars and du Pont took a total of 192 tank cars from American Car & Foundry.

Chicago, Milwaukee, St. Paul & Pacific bought eight diesel-electric locomotives, one of 4000 hp. from Electro-Motive and American Locomotive Co., two 1000-hp. switchers from American Locomotive Co., one of 5400 hp. and one of 60 hp. from Electro-Motive and two 44-ton switchers from Davenport Besler Corp.

Rock Island bought three 2000-hp. diesel-electric locomotives, two from Electro-Motive Corp. and one from American Locomotive Co., also five 44-ton units from the Davenport Besler Corp. This road is reported to be taking informal bids on 1000 box cars.

Chicago & North Western ordered three 660-hp. switchers from American Locomotive Co. and three 350-hp. units from Whitcomb Locomotive Co. Pennsylvania took one 1000-hp. switcher from Electro-Motive.

Davenport Besler Corp. is building two 44-ton units for St. Louis-San Francisco and one for the Dewey Portland Cement Co. Baldwin is constructing two diesel-electric switchers for Day & Zimmerman, Inc., Philadelphia, and one 0-8-0 unit for Pickands, Mather & Co., Cleveland.

Chicago, Indianapolis & Louisville has obtained authority to buy 210 freight cars and Louisville & Nashville is reported in the market for 2000 freight cars.

St. Louis Public Service Co. will buy 110 buses from the Yellow Coach division of General Motors Corp. and 170 from Mack International Truck & Coach Co., costing $2,688,000.

Reinforcing Steel

. . . Awards are 25,800 tons, new projects only 3700 tons

Reinforcing steel awards advanced to 25,800 tons from 16,100 tons last week. The largest lettings include 6000 tons for an ammunition depot at Fort Wingate, N. M.; 3500 tons for a bomber assembly plant at Omaha, Neb., for Glenn L. Martin; 2000 tons for a power plant at Charleston, Ind.; 1800 tons for a dam at Norfolk, Ark.; 1500 tons for a Navy supply depot at Bayonne, N. J.; 1400 tons for five hangars at Gravelly Point, Md., and 1190 tons at Jacksonville, Fla., for the Jefferson Madison homes.

New reinforcing steel projects declined to 3700 tons and include no inquiry for more than 700 tons.

Bolts, Nuts and Rivets

. . . Production continues at near-capacity rates

At Cleveland production of all items continues close to the limit of capacity except where inability to obtain raw material promptly constitutes a hurdle. Demand from the railroad industry and other transportation fields has shown a pick-up.

Wire Products

. . . Galvanizing extras on nails are raised 25c.

Backlogs are still growing in all principal divisions at CLEVELAND. Manufacturers sales show an increasing proportion of defense business. Merchant wire demand is at a seasonal peak in all major markets. Effective April 1, galvanizing extras on nails were raised 25c. due to higher costs brought about by the zinc situation. A slight change has been made recently in bundling of bale ties, whereby some bundles formerly containing 200 ties now contain 500.

Wire and wire product market factors are substantially unchanged from a week ago at PITTSBURGH. Incoming business remains ahead of production and shipments.

Merchant Bars

. . . National defense requirements expanding rapidly

Establishing new high levels in the volume of steel bookings, bar sales continue to lead in demand at PITTSBURGH. Requirements for national defense are expanding rapidly. As long as there is no arbitrary check on the placing of commercial business, consumers are expected to order substantial tonnages consistently. The automobile industry remains the prime buyer.

CHICAGO mills face heavy fresh demands for shell steel with practically all companies in production on orders placed late last fall, and 44 new contracts ranging from $50,000 to $11,000,000 scheduled for placement within 10 days. Since most of these new contracts will be additions for plants already in production, steel orders will come out faster. Both carbon and alloy bar orders are ahead of shipments there.

Sales volume at CLEVELAND in merchant bars showed more shrink-

age last week than any other major product. The development holds no great importance, however, because of record order backlogs plus the definite knowledge heavy new defense business which will be forthcoming soon.

Tubular Goods

. . . Galvanized pipe up $6, owing to zinc shortage

The galvanized extra on standard steel and wrought iron pipe has been revised three points, bringing about an increase of $6 a ton. This revision partly compensates for the increase in the price of spelter. Line pipe demand is running a close second to standard pipe requirements. Oil country purchases are brisk.

At CLEVELAND and YOUNGSTOWN demand from all major consuming fields continues strong. Jobbers are constantly returning to the market and oil companies have been heavy purchasers. Backlogs insure steady production for the balance of the second quarter.

Structural Steel

. . . Demand for defense plants may have passed the crest

Demand for fabricated structural steel for defense plants appears to have passed the crest. Indications are that from this point on the amount of new work will be in diminishing volume. This week's fabricated steel awards total 23,350 tons compared with 27,400 last week.

Outstanding lettings are 3000 tons at Alloy, W. Va., for buildings for the Electro-Metallurgical Corp.; 3000 tons for a plate shop at San Pedro, Cal., for the Navy Department; 2400 tons for a plant at York, Pa., for the York Safe & Lock Co.; 2300 tons at Alcoa, Tenn., for pot shells and saddles for the Aluminum Co. of America; 2000 tons for additional shell loading building at Ravenna, Ohio; 1000 tons for the Delco-Remy plant at Anderson, Ind.; 1000 tons for processing chambers for the Aluminum Co. of America at Pittsburgh, and 1000 tons at Los Angeles, for a bridge.

New structural steel projects of 38,300 tons are swelled by 26,000 tons for a bomber assembly plant for the Army at Tulsa, Okla.,

Plates

. . . Priority program depends on a number of factors

Whether mandatory priorities are applied to ship plates is a matter that probably will be determined by the progress on other phases of the shipbuilding program. At the moment the supply of forgings is more serious than the plate situation and has resulted in meetings between representatives of the OPM and the forgings industry during the past week. New forging equipment is to be installed in a number of plants to take care of merchant ship work. Most of the heavy forging equipment, including that to be installed under a $40,000,000 appropriation a few months ago, is filled up with Navy work.

PITTSBURGH plate makers see a substantial task ahead in furnishing ship plates on schedules set up by the Government. Some sources believe that this steel will be produced and shipped before some of the shipbuilding plants are ready to consume it.

Recent rollings of wide heavy plates at CLEVELAND included sizable tonnages for Canada. Inquiries have shown a decided bulge recently, particularly from the railroad field. Fill-in tonnages for shipbuilding, including one lot of 16,000 tons, are also being sought.

Deliveries in a few plate sizes have lengthened slightly in CHICAGO. The tight situation there is affecting carbuilding and other programs which rest on the defense borderline. New plate orders are unabated there.

Eastern Pennsylvania plate consumers are encountering difficulty in placing additional tonnage on mill books.

Sheets and Strip

. . . Extras changed on commodity cold rolled strip

Commodity cold rolled strip extras now run from 0.0284 to 0.0709 in thickness only, which means that 0.0710 in. and heavier up to 0.1419 in. have been placed on the cold rolled strip card. The effect is to advance the price of the eliminated gages. However, the bulk of the material bought by the auto industry and tubing makers falls below 0.0710 in.

With pressure for deliveries terrific and the volume of fresh orders even greater than a month ago, PITTSBURGH sheet and strip makers find themselves establishing new high levels of production and shipment. As expected, the making of additional plate tonnage on high speed mills is giving some worries with more to follow. Flat rolled deliveries are more extended.

Sustained heavy demand for electrical and enameling sheets is a feature of the market at CLEVELAND.

Coke

. . . Beehive production will be halted if strike is not settled

If the coal strike is not settled by the middle or latter part of this week, beehive production will come to a standstill for at least 10 days. If the strike is not settled no new coal can be charged when the coke is being drawn. In such a situation the ovens most probably will become cold and it will take at least 10 days to heat them again. Added to this will be three days for shipments which would mean a total loss of 13 days in beehive coke distribution. There is a possible chance that the coal strike will have been settled in time to recharge the beehive ovens around the time the coke is being drawn, thus preventing the tie-up in distribution.

PITTSBURGH reports some merchant blast furnaces have been kept going by the action of brokers in obtaining by-product coke supplies. Beehive coke supplies came to a standstill because beehive operators are affiliated with the UMW. Coal charged in the beehive ovens in western Pennsylvania prior to the strike call was in many cases early this week still sealed in the ovens. Plans were made early this week to pull this coke in accordance with a previous agreement.

Tin Plate

. . . This year's demand may be 20% over 1940

With cold reduction mills operating at at least 100 per cent of capacity, tin plate makers look for an overall increase in requirements this year of about 20 per cent over 1940.

Machine Tools

. . . SALES, INQUIRIES AND MARKET NEWS

Machine Tool Sales Heavier Than Shipments

Pittsburgh

• • • **The machine tool industry** is still selling more machine tools each month than it is shipping, despite a steady climb in output each month, Tell Berna, general manager, National Machine Tool Builders Association, told engineers attending the Westinghouse Machine Tool Electrification Forum, which started at East Pittsburgh April 14. Mr. Berna predicted that there would be no flattening out of demand for at least 18 months. He believes that machine tool industry is now meeting demands for machine tools as fast as defense industries can train operators to man the machines and put them to work. Machine tool specialists on OPM Washington leave have studied all defense bottlenecks and are shifting machine shipments to fill gaps in production lines and help defense manufacturers over the hump.

Mr. Berna declared the machine tool industry can no longer be called the bottleneck of defense production. Real bottlenecks today are in gages, jigs, fixtures and special tools; in tool makers to make them and in tool engineers to design them. These men cannot be trained in a matter of a few weeks like machine operators are, he said.

Fresh Wave of Buying Expected At Cleveland

Cleveland

• • • **There is a strong** possibility that a national buying wave approaching last fall's record peak may confront the industry, according to the recent trend of developments at Washington. In such event the industry's greatly expanded productive facilities would be hard pressed once more.

Production in this vicinity continues to edge higher, but despite the high rate prevailing all this year the reduction of order backlogs has been only negligible. The wide scale subcontracting inaugurated several months ago by producers is beginning to be of real assistance.

Further Additions To Capacity At Cincinnati

Cincinnati

• • • **With new business** still exceeding plant capacity, machine tool interests in this area are steadily wrestling with the problems of production. The American Tool Works has announced the starting of work on a $250,000 addition to its already substantial plant in Cincinnati. The King Machine Tool Co. has purchased a large tract of land in suburban Cincinnati, announcing that a large shop would be erected. This plant, it was announced, is primarily for the making of machines for naval ordnance work.

Small Machine Shops Visited on Britain's Behalf

Boston

• • • **Allister R. Tulloch,** assistant to the national defense coordinator in the Springfield, Mass., area, is making an effort to place at least a part of the British Purchasing Commission's $10,000,000 orders in Connecticut Valley machine shops.

He and representatives of the British commission have personally visited every machine shop in the area. The size of the shop will make no difference even if it has only one or two machines eligible for work; financing, if necessary, will be provided; the commission is willing to aid in training men to operate idle machines, and if necessary take specialists off machines filling its orders to have them train new help.

Non-Ferrous Metals
. . . MARKET ACTIVITIES AND PRICE TRENDS

New York, April 15—A quieter aspect characterized major non-ferrous markets in the past week as regards further government announcements on price control. More definite information on the extension of maximum prices to all grades of copper and some form of regulation in the brass market were expected before the end of the week. It was also believed possible that an official maximum price might be contemplated in the primary zinc market.

Including 31,201 tons of duty-paid foreign copper sold through the Metals Reserve Co., deliveries of refined copper in March increased sharply to 134,333 tons, up 19 per cent from the previous month's total of 112,808 tons. Domestic deliveries alone declined by 9676 tons, or about 9 per cent. Refined stocks at the end of March totaled 89,873 tons, an increase of 8 per cent over February. Domestic production rose to 95,322 tons in March, about 2 per cent higher than the February output of 93,654 tons. It is expected that more than 50,000 tons of government-owned copper, including 20,000 tons of French metal stored here and acquired recently, will be shipped during April. Mine producers continued to allocate metal at 12c. during the past week, while custom smelters reported inquiry light at 12.50. The export market was unchanged at 11c., f.a.s.

Zinc

Although there has been no attempt so far to fix maximum prices on primary zinc, the concerted government effort to keep all non-ferrous metals as well as other materials under control, as evidenced further by last week's creation of the new Office of Price Administration and Civilian Supply, might well indicate a possible move in this direction. Total amount of zinc allotted to the galvanizing industry, already feeling the pinch in supplies, will be cut down by about 40,000 a year when that amount is turned over to brass cartridge makers. In the regular market both sales and shipments declined in the past week. Sales were 4066 tons, as compared with 6341 on the previous week, while shipments were down to 5025 tons from 6170 two weeks ago. Unfilled orders were reduced by 1000 tons to 93,199.

Lead

Consuming demand has been characterized by a lessening in pressure since the government request for unchanged prices, although inquiry has remained in very satisfactory volume. In several directions sellers not only disposed of intake but carried over some demand from day to day. It is generally believed that buyers have taken care of their immediate needs with a good margin to spare and that fairly good stocks have been built up.

Present domestic production plus the intake of foreign lead, appears to be ample, which suggests that there is no need for consumers to carry large inventories. April needs are now 100 per cent covered, while May is 60 per cent accounted for.

Tin

The market was relatively active with gradually rising prices in the past week. Prompt Straits metal rose from 51.625c. a lb. on Wednesday to 52.125c. at the beginning of the present week. May and June arrivals were offered for 51.75c. and 51.50, with some business done at the first figure. The Navy Department has called for bids on 250 tons of Grade A tin to be delivered at the Brooklyn Navy Yard.

Scrap . . . MARKET ACTIVITIES AND QUOTATION TRENDS

The first modification of the government price schedule on iron and steel scrap was an extension for 30 days (to May 10) of the clause in the original announcement requiring completion by April 10 of contracts entered into prior to April 3. The revised order permits a further extension under certain specified conditions.

There are two exceptions to the former rule that the dealer must have taken physical possession of the scrap before April 3. These are: 1. If the scrap originated from a demolition operation begun but not finished before April 3, or 2, if the scrap was bought before April 3 and accumulated at a point of shipment, but not delivered because of transportation facilities.

It apparently is not the intention of the Price Administrator's office to issue prices on grades not covered in the first announcement. Market prices on such items, which are usually secondary grades, can be worked out by negotiation in the trade provided they are under the ceiling price for the particular classification and also provided that a defensible differential is maintained. For example, No. 2 cast scrap, on which no price was announced, can be bought or sold at a price under the ceiling for No. 1 cupola cast, but it is said in Washington that differentials in line with normal practice should be maintained.

There are some disparities in the price schedule which may eventually have to be ironed out. One is the fact that cast scrap prices are extremely high in areas which have a high freight rate on pig iron from nearest furnaces. The Pacific Coast presents an outstanding example, but there are others. The fixing of an arbitrary freight charge on the pig iron, not to exceed a certain amount, might ameliorate this condition.

The British Iron & Steel Corp. wants about 75,000 tons of scrap for shipment in May. This may create a problem because of the price limit placed on export purchases. For example, scrap originating in the vicinity of New York can move to Buffalo by barge at a price f.o.b. shipping point too high for exporters to meet under the regulations. A possible solution of this problem lies in the monthly reports of inventories to be submitted by all mills, by which it could be determined that certain mills could temporarily stay out of the market while British orders were being filled.

THE IRON AGE scrap composite is unchanged from last week at $19.17.

Pittsburgh

Dealers and brokers are still busy shipping on old orders, but there have been a few transactions at the new established prices. On items not covered by government prices, buyers and sellers are feeling their way in order to arrive at an equitable quotation based on the intent of the government setup. Some quotations carried in the Pittsburgh market are based on small transactions until further clarification occurs.

Philadelphia

Most direct result of government controls in eastern Pennsylvania has been a substantial increase in the flow of scrap to mills as dealers work to close out old contracts before expiration of time allotted. Buying on the new price basis so far has been in small volume and there has been some hesitancy on the part of small suppliers to sell at the new levels immediately. For the present district mills hold fair stock positions, varying from a month's supply upward, but it remains to be seen whether scrap will continue to flow in adequate volume. Cast price spreads have been adjusted this week, but have not yet been tested by actual transactions.

Chicago

With major railroads still figuring the average price of their sales over the six month period preceding fixed scrap prices, transactions on items not covered in formal government lists are still held up. Several small lists were closed with brokers bidding in a way that would permit them to get whatever quantity the roads have available at the maximum price. Practically all sales made so far are at government prices, though one mill is buying No. 2 steel at $1 below the official maximum.

Cleveland

Vessel shipments of scrap started coming in here last week and will be heavy over the remainder of this month. Rail shipments also have been brisk with all interests seeking to wind up old contracts as quickly as possible. Foundrymen at a meeting here last Friday expressed great concern over the cast scrap situation. Local dealers have drawn up a proposal for arbitrarily setting cast scrap prices which would provide stated differentials and eliminate inconsistencies.

St. Louis

Shipments of scrap iron to dealers in the St. Louis area continue heavy, receipts being used to cover short contracts before May 10. But dealers are making no new commitments on items fixed by the government as the mills are out of the market.

Cincinnati

The first week's operation under the government scrap prices has been one of extreme confusion, and practically no business has been conducted. Their inability to operate is partially due to the unwillingness of scrap producers to sell at present quotations, and most of yard scrap has been laid down at prices above the new ceiling. Extension of deliveries on old contracts to May 10 has helped to relieve the situation.

Detroit

Dealers and brokers in Detroit report that they have worked out a schedule of "dealers' buying prices, per gross ton, f.o.b. cars" which will permit prices to be quoted on the former basis employed by THE IRON AGE for the Detroit area. These prices are adjusted to fall within the maximums set up in the official government prices and take into account the fact that the government prices are specified on the basis "delivered to consumer." Since there has been only nominal market activity in the past week and no major transactions to test these figures it is difficult to regard them in any other light except that they are prices tentatively offered to producers of scrap. The margins between the quoted figures and the established government prices are those normally expected to cover freight from local points to the consuming point.

New York

The 30-day extension until May 10 for completion of contracts has brought about a spurt in this market. Scrap was coming into the market at a good rate last week. New business is not being taken. No prices are quoted on specialties.

Boston

Actual business is confined almost exclusively to completing outstanding contracts. Because of their urgent need, consumers are pressing for shipments. Thus new prices established by Washington are nominal. Confusion still exists regarding the status of all prices. Scrap interests figure quotations on steel turnings will range from $8.88 up to $9.40 a ton, depending on delivery point, and corresponding spreads will apply to other scrap.

Scrap Prices

Government ceiling prices are given in bold face type;
Market quotations as reported by THE IRON AGE are shown in Italics.

Dollars per Gross Ton delivered to Consumers at: →	Pittsburgh	Chicago	Eastern Pennsylvania	Youngstown	Cleveland	Southern Ohio	Buffalo	Birmingham	St. Louis	New England	Duluth	Pacific Coast	Dealers' buying prices, Dollars f.o.b. cars: Detroit	New York*	Toronto	Export N. Y.
STEEL GRADES																
No. 1 heavy melting steel	$20.00	$18.75	$18.75	$20.00	$19.50	$18.50	$19.25	$17.00	$17.50	$15.50	$18.00	$14.50	*$16.50 to $17.00*	$15.25	*$12.50*	*$15.25*
No. 2 heavy melting steel	19.00	*16.75 to 17.75*	17.75	19.00	18.50	17.50	18.25	16.00	16.50	14.50	17.00	13.50	*15.50 to 16.00*	14.25	*10.50*	*14.25*
New black hyd. comp. sheets	20.00	18.75	18.75	20.00	19.50	18.50	19.25	17.00	17.50	15.50	18.00	14.50	*16.50 to 17.00*			
No. 1 dealers' bundles	19.00	17.75	17.75	19.00	18.50	17.50	18.25	16.00	16.50	14.50	17.00	13.50				
No. 2 dealers' bundles	18.00	16.75	16.75	18.00	17.50	16.50	17.25	15.00	15.50	13.50	16.00	12.00				
Mixed borings and turnings	15.50	14.25	14.25	15.50	15.00	14.00	14.75	12.50	13.00	9.25	13.50	10.00	*12.00 to 12.50*	10.75	*9.50*	
Machine shop turnings	15.50	14.25	14.25	15.50	15.00	14.00	14.75	12.50	13.00	9.40	13.50	10.00	*11.00 to 11.50*	10.75	*9.00*	
Shoveling turnings	16.50	15.25	15.25	16.50	16.00	15.00	15.75	13.50	14.00		14.50	11.00	*12.00 to 12.50*			
Heavy steel axle turnings	*19.50*				*18.50*											
Heavy steel forge turnings	*18.50*															
Drop forge flashings					*18.50*		*18.25*						*16.00 to 16.50*		*10.50*	
No. 1 busheling	19.50	18.25	18.25	19.50	19.00	18.00	18.75	16.50	17.00	15.00	17.50	14.00	*16.00 to 16.50*		*7.50*	
No. 2 busheling	15.50	14.25	14.25	15.50	15.00	14.00	14.75	12.50	13.00	11.00	13.50	10.00	*9.50 to 10.00*			
Uncut structural and plate scrap	19.00	17.75		19.00	18.50	17.50	18.25	16.00	16.50	14.50	17.00	13.50				
L. phos. billet, bar crops, p'nchgs	25.00	23.75	23.75	25.00	24.50	23.50	24.25	22.00	22.50	20.50	23.00	19.50				
Low phos. heavy plate	*24.50 to 25.00*												*19.00 to 19.50*			
RAILROAD GRADES																
No. 1 RR heavy melting steel	$21.00	$19.75	$19.75	$21.00	$20.50	$19.50	$20.25	$18.00	$18.50	$16.50	$19.00	$15.50	*$18.85*			
Scrap rails	22.00	20.75		22.00	21.50	20.50	21.25	19.00	19.50	17.50	20.00	16.50	*19.85*	$17.25		
Scrap rails 3 ft. and under	24.00	22.75		24.00	23.50	22.50	22.75	21.00	21.50	19.50	22.00	18.50	*21.85*	19.25		
Scrap rails 2 ft. and under	24.50	23.25		24.50	24.00	23.00	23.75	21.50	22.00	20.00	22.50	19.00	*22.35*	19.75		
Scrap rails 18 in. and under	25.00	23.75		25.00	24.50	23.50	24.25	22.00	22.50	20.50	23.00	19.50	*22.85*	20.25		
Rerolling rails	23.50	22.25		23.50	23.00	22.00	22.75	20.50	21.00	19.00	21.50	18.00	*21.35*	18.75		
RR couplers and knuckles	*24.50 to 25.00*															
Coil and leaf springs	*25.00 to 25.50*								*22.00 to 22.50*							
Steel wheels	*25.00 to 25.50*															
RR malleable	*24.50 to 25.00*				*23.50*				*20.50 to 21.50*							
Steel axles									*25.50 to 26.00*							
Locomotive tires									*20.00 to 20.50*							
FOUNDRY GRADES																
No. 1 cupola	$22.55 to $23.94	$22.60	$23.50 to $24.50	$22.50 to $23.39	$22.50		$22.00 to $22.50	$18.00					*$21.50 to $22.00*	*$21.00*	*$20.00*	
Heavy breakable cast	*21.05 to 22.44*	21.10	*22.34 to 23.03*	*21.00 to 21.69*	20.50		20.00 to 20.50			$18.25			*17.50 to 18.00*	*18.80*	*18.00*	
Stove plate	17.55 to 18.94	17.60	*18.84 to 19.53*	17.50 to 18.39	17.50		17.00	13.00		14.50			*15.00 to 15.50*	*17.50*	*16.00*	*$17.50*
Cast iron car wheels	22.55 to 23.94															
Grate bars									*$14.50 to $15.00*							
Cast iron borings	15.50	14.25	14.25	15.50	15.00	$14.00	14.75	12.50	13.00	11.00	$13.50	$10.00	*12.00 to 12.50*	10.75	*9.00*	
Cast iron borings (chem.)																
Unprepared yard scrap														*10.50*		

* For delivery to Eastern Pennsylvania consumers

All consumers' prices subject to 3 per cent broker's commission.

Construction Steel

. . .STRUCTURAL STEEL, REINFORCING BARS, PLATES, PILING, ETC.

Fabricated Steel

Lettings declined to 23,350 tons from 27,400 tons last week; new projects jump to 38,300 tons; plate awards only 120 tons.

AWARDS

NORTH ATLANTIC STATES

2400 Tons, York, Pa., plant for York Safe & Lock Co., to Bethlehem Steel Co., Bethlehem, Pa.

1000 Tons, Pittsburgh, processing chambers for Aluminum Co. of America, to Manufacturers & Fabricators, Elyria, Ohio.

800 Tons, Bristol, Pa., building for Fleetwings, Inc., to Belmont Iron Works, Philadelphia.

550 Tons, Quincy, Mass., warehouse B, shipbuilding division, Bethlehem Steel Co., to Bethlehem Steel Co., Bethlehem, Pa.

500 Tons, Lackawanna, N. Y., ore bridge for Bethlehem Steel Co., to Lackawanna Steel Construction Corp., Buffalo, through Wellman Engineering Co., Cleveland.

380 Tons, Middle River, Md., grade crossing elimination, to American Bridge Co., Pittsburgh.

300 Tons, Philadelphia, open hearth furnace steel works and buck stays for Midvale Co., to Belmont Iron Works, Philadelphia.

275 Tons, Ilion, N. Y., factory and office building for Remington-Rand Co., Inc., to American Bridge Co., Pittsburgh.

250 Tons, North Tonawanda, N. Y., warehouse for Buffalo Bolt Co., to Buffalo Structural Steel Co., Buffalo.

200 Tons, Niagara Falls, N. Y., plant extension for Great Lakes Carbon Co., to Bethlehem Steel Co., Buffalo.

165 Tons, Washington County, Pa., State bridge, to Keystone Engineering Co., Pittsburgh.

155 Tons, East Rutherford, N. J., Flintkote building, to Oltmer Iron Works, Jersey City, N. J.

150 Tons, Buffalo, warehouse for Iroquois Gas Co., to R. S. McMannus Steel Construction Co., Buffalo.

140 Tons, Clinton County, Pa., highway bridge, to Bethlehem Steel Co., Bethlehem, Pa.

135 Tons, Brooklyn, extension to Blaine Dry Cleaning building, to Simon Holland & Son, Inc., Brooklyn.

120 Tons. McKeesport, Pa., Murphy store, to Guibert Steel Co., Pittsburgh.

110 Tons, Allegheny County, Pa., State bridge, to Fort Pitt Bridge Works Co., Pittsburgh.

100 Tons, Woburn, Mass., Atlantic Gelatine Co. plant, to A. O. Wilson Structural Co., Cambridge, Mass.

THE SOUTH

3000 Tons, Alloy, W. Va., buildings for Electro Metallurgical Co., to Bethlehem Steel Co., Bethlehem, Pa.

2300 Tons, Alcoa, Tenn., pot shells and saddles for Aluminum Co. of America, to Chicago Bridge & Iron Co., Chicago.

650 Tons, Louisville, Ky., carbide plant for Air Reduction Co., to Bethlehem Steel Co.

220 Tons, Kanawha County, W. Va., State bridge, to Riverside Steel Co., Wheeling, W. Va.

200 Tons, Tennessee, transmission towers for TVA, to Bethlehem Steel Co., Bethlehem, Pa.

200 Tons, Norfolk, Va., Navy assembly shop, to Ingalls Iron Works Co., Pittsburgh plant, through Rust Engineering Co.

200 Tons, Little Rock, Ark., State overpass, to an unnamed bidder.

150 Tons, Bogalusa, La., warehouse for Gaylord Container Co., to Ingalls Iron Works Co., Birmingham.

CENTRAL STATES

2000 Tons, Ravenna, Ohio, additional shell loading buildings, to Bethlehem Steel Co., Bethlehem, Pa.

1000 Tons, Anderson, Ind., building for Delco-Remy Co., to Indiana Bridge Co., Muncie, Ind.

375 Tons, Trumbull County, Ohio, State bridge, to Bethlehem Steel Co., Bethlehem, Pa., through Horvitz Co.

300 Tons, Chicago, manufacturing building for Mills Novelty Co., to American Bridge Co., Pittsburgh.

WESTERN STATES

3000 Tons, San Pedro, Cal., plate shop for Navy, to Columbia Steel Co., San Francisco.

1000 Tons, Los Angeles, bridge over Los Angeles River, to Columbia Steel Co., San Francisco.

250 Tons, Seattle, Northwest Steel Rolling Mills, Inc., furnace building, to Isaacson Iron Works, Seattle.

150 Tons, Mare Island, Cal., Navy Yard facilities, to Phoenix Iron Works, Oakland, Cal., through Henry J. Kaiser Co., Oakland, contractor.

BRITISH WEST INDIES

600 Tons, Trinidad, hangar, to United States Steel Products Co., New York; James Stewart & Co., contractors.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

2500 Tons, Baltimore, staging towers for Bethlehem Steel Co., Bethlehem Fairfield Shipyard, Inc.

900 Tons, Hartford, Conn., State by-pass bridge.

650 Tons, Philadelphia, pattern shop for Navy Department.

550 Tons, Lakewood, N. Y., State bridge RC-41-3.

500 Tons, Coatesville, Pa., Lukens Steel Co. expansion; bids in. Arthur G. McKee & Co., Cleveland, general contractors.

290 Tons, Fleetwood, N. Y., Westchester County bridge.

275 Tons, Oswego, N. Y., crane runways, building, and building addition for Fitzgibbons Boiler Co.

265 Tons, Hartford, Conn., buildings for Connecticut Co.

255 Tons, Monessen, Pa., buckstays and oven framing for Monessen Coke & Chemical Co.

225 Tons, Sidney, N. Y., building for Scintilla Magneto division, Bendix Aviation Corp.

210 Tons, Hagerstown, Md., State bridge.

120 Tons, Economy, Pa., extension to slab and billet storage building for A. M. Byers Co.

THE SOUTH

26,000 Tons, Tulsa, Okla., bomber assembly plant for Army; bids to be asked within 30 days by U. S. Engineers' office at Oklahoma City.

475 Tons, Weirton, W. Va., 315 tons for coal bin steelwork, 160 tons for buckstays and oven framing for Weirton Steel Co.

145 Tons, Point Pleasant, W. Va., Kenango, Ohio, bridge repairs for West Virginia.

140 Tons, Baton Rouge, La., store addition for S. H. Kress & Co.

CENTRAL STATES

1500 Tons, Fairfield, Ohio, three warehouses at Patterson Field, for U. S. Engineers office.

525 Tons, Lansing, Mich., Western High school.

350 Tons, Unnamed location, Altamaha River bridge for Seaboard Air Line Railway.

330 Tons, Chicago, coal handling structures for Commonwealth Edison Co.

300 Tons, Sturtevant, Wis., State bridge No. 383.

300 Tons, Camp Perry, Ohio, warehouse and garage for Ohio National Guard.

240 Tons, Dayton, Ohio, foundry for Acme Pattern & Tool Co.

165 Tons, Cincinnati, addition to building No. 38 for Cincinnati Chemical Works.

WESTERN STATES

575 Tons, Los Angeles division, reconstruction bridge A-140 for Santa Fe Railroad.

215 Tons, North Powder and Lonard, Ore., bridges for Union Pacific Railroad.

168 Tons, Toppenish, Wash., Dry Creek bridge; bids April 22.

135 Tons, Post Falls, Idaho, State underpass FAGH-54-A-4.

FABRICATED PLATES

AWARDS

120 Tons, Tacoma, Wash., tanks and equipment for Philadelphia Quartz Co. plant, to Ace Furnace Co., Tacoma.

PENDING PROJECTS

3000 Tons, Longview, Wash., pot shells for Reynolds Metals Co. plant.

SHEET PILING

AWARDS

550 Tons, Mare Island, Cal., Navy Yard facilities, to Bethlehem Steel Co., San Francisco.

Weekly Bookings of Construction Steel

Week Ended →	Apr. 15, 1941	Apr. 8, 1941	Mar. 18, 1941	Apr. 16, 1940	Year to Date 1941	Year to Date 1940
Fabricated structural steel awards	23,350	27,400	25,100	9,950	474,435	219,710
Fabricated plate awards	120	780	1,250	4,105	49,905	48,095
Steel sheet piling awards	550	0	100	1,505	13,430	11,995
Reinforcing bar awards	25,800	16,100	24,150	10,500	194,600	129,370
Total Letting of Construction Steel	49,820	44,280	50,600	26,060	732,370	409,170

Reinforcing Steel

Awards of 25,800 tons; 3,700 tons in new projects.

AWARDS

ATLANTIC STATES

1500 **Tons,** Bayonne, N. J., Navy supply depot, to Truscon Steel Co., New York; Mahony-Troast Construction Co., Passaic, and Wigton Abbott Corp., Plainfield, N. J., contractors.

1400 **Tons,** Gravelly Point, Md., five hangars, to Bethlehem Steel Co., Bethlehem, Pa.

965 **Tons,** Buffalo, grain storage plant for G. L. F. Mills Co., Inc., to Truscon Steel Co., Buffalo, through James Stewart Construction Co., Chicago.

520 **Tons,** Tonawanda Township, N. Y., Huntley steam plant addition, Buffalo-Niagara Electric Corp., to Truscon Steel Co., Buffalo.

119 **Tons,** Weathersfield, Conn., bridge, to Truscon Steel Co., Youngstown, through Patterson & Rossi.

100 **Tons,** Fort Monmouth, N. J., barracks, to Igoe Brothers, Newark; Tueller Construction Co., Red Bank, N. J., contractor.

SOUTH AND CENTRAL

6000 **Tons,** Fort Wingate, N. M., ammunition depot, to Ceco Steel Products Corp., Chicago.

3500 **Tons,** Omaha, Neb., Glenn L. Martin bomber assembly plant, to Ceco Steel Products Corp., Chicago, and Sheffield Steel Corp., Kansas City.

2000 **Tons,** Charlestown, Ind., power plant, to Republic Steel Co., through Colonial Supply Co., Louisville, Ky.

1800 **Tons,** Norfolk, Ark., dam, U. S. Engineer's office, to Sheffield Steel Corp., Kansas City, Mo.; Utah Construction; Morrison-Knudson Co., contractors.

1190 **Tons,** Jacksonville, Fla., Jefferson-Madison Homes, to Truscon Steel Co., Youngstown, through Fred Holland, Inc.

680 **Tons,** Conley, Ga., mesh for 14 warehouses for War Department, to Truscon Steel Co., Youngstown, through A. Farnell Blair.

422 **Tons,** Duval City, Fla., highway project, to Truscon Steel Co., Youngstown, through H. E. Wolfe Construction Co.

400 **Tons,** Jackson County, Mo., Remington Arms Co. plant, to Sheffield Steel Corp., Kansas City, Mo., Walbridge-Aldinger & Foley Bros., contractors.

400 **Tons,** Lake City, Mo., small arms plant, to Sheffield Steel Corp., Kansas City.

360 **Tons,** Williamsburg, Va., Colonial National Park building, to Bethlehem Steel Co., Bethlehem, Pa., through Virginia Steel Co.

253 **Tons,** Lister, Ala., casting house, Reynolds Alloys Co., to Truscon Steel Co., Youngstown.

200 **Tons,** Lake County, Ohio, State project No. 12, to Truscon Steel Co., Youngstown, through Horvitz Co.

190 **Tons,** Flint, Mich., Bell Telephone Co. building, to Truscon Steel Co., Youngstown.

182 **Tons,** Midland, Mich., plant for Dow Chemical Co., to Truscon Steel Co., Youngstown, through Austin Co., Cleveland.

165 **Tons,** Columbiana County, Ohio, State project No. 2, to Bethlehem Steel Co., Bethlehem, Pa., through G. B. and C. H. Patterson.

140 **Tons,** Trumbull County, Ohio, State project No. 13, to Truscon Steel Co., Youngstown, through Horvitz Co.

130 **Tons,** Hyde Park, Ill., Bell Telephone Co. building, to Olney J. Dean Steel Co., Chicago, through W. J. Lunch Co.

120 **Tons,** Buford, N. D., Bureau of Reclamation Invitation No. 16228-A, to Sheffield Steel Corp., Kansas City.

108 **Tons,** Chicago, shops and garage, Van Buren and Sherman Streets, to Inland Steel Co., Chicago.

WESTERN STATES

585 **Tons,** Camarillo, Cal., State hospital buildings, to Soule Steel Co., Los Angeles, through Azevedo Construction Co., Sacramento, Cal., contractor.

550 **Tons,** Longview, Wash., Reynolds Metals Co. plant, to Truscon Steel Co., Portland, Ore., through Austin Co., Seattle, contractor.

390 **Tons,** Paso Robles, Cal., San Juan Creek highway bridge, to San Jose Steel Co., San Jose, Cal., through Dan Caputo, San Jose, contractor.

354 **Tons,** Friant, Cal., Central Valley project (Invitation 48,777-A), to Bethlehem Steel Co., San Francisco.

275 **Tons,** Benson, Ariz., state highway underpass, to Allison Steel Mfg. Co., Phoenix, Ariz., through Pearson & Dickerson, Prescott, Ariz., contractor.

107 **Tons,** Oakland, Cal., East Bay Municipal Utility District list (Proposal 1416), divided between Herrick Iron Works, Oakland, and Beatie Steel & Supply Co., Oakland.

HAWAII

685 **Tons,** Fort Shafter, T. H., Army barracks C and D, to Bethlehem Steel Co., Los Angeles, through Robert E. McKee, Los Angeles, contractor.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

700 **Tons,** Newark, N. J., Defense housing project; H. R. H. Construction Co., contractor.

700 **Tons,** Astoria, L. I., Department of Parks contract CH 41-1; J. Leopold & Co., N. Y., low bidder for contract.

550 **Tons,** Beaver County, Pa., Curtiss-Wright Corp. airplane propeller plant.

545 **Tons,** Somerville, Mass., Sears-Roebuck & Co., warehouse.

176 **Tons,** Elmira, N. Y., U. S. Engineers' flood control, section No. 1.

SOUTH AND CENTRAL

270 **Tons,** Tuscarawas County, Ohio, State project No. 17; bids in.

160 **Tons,** Dubuque, Iowa, Mississippi River bridge.

130 **Tons,** Washington County, Ohio, State project No. 18; bids in.

102 **Tons,** Huntington, Ind., State highway, contract No. 2154.

WESTERN STATES

400 **Tons,** Great Falls, Mont., grain elevator.

PUERTO RICO

313 **Tons,** U. S. Engineers' Invitation No. 1097-41-214; bids taken.

COSTA RICA

320 **Tons,** FWA Invitation No. CR-43; bids taken.

Cast Iron Pipe

Brookline, Mass., has purchased its 1941 pipe requirements from Donaldson Iron Co., Emaus, Pa., on a basis of $56.40 a ton. For special castings the town paid $114 a ton.

Worcester, Mass., has purchased approximately 26,000 ft. of pipe from R. D. Wood Co., Philadelphia.

Board of Public Works, Valparaiso, Ind., plans pipe line extensions and improvements in water system and other waterworks installation. Cost about $45,000. Financing is being arranged through Federal aid. W. E. Moreland, City Hall, is city engineer.

Woodstock, Ill., plans call for bids early in May for pipe line extensions in water system; also new elevated steel tank and tower. Cost about $50,000. Alvord, Burdick & Howson, 20 North Wacker Drive, Chicago, are consulting engineers.

Warrenton, Ore., plans water pipe line system, including main line, in connection with extensions and improvements for increased supply, including service at Fort Stevens and Camp Clatsop. Entire project will cost about $430,000. Financing has been arranged through Federal aid. Clifford Barlow is city manager.

Solomon, Kan., plans water pipe line system and other waterworks installation. Cost about $30,000. Financing will be arranged through Federal aid. Paulette & Wilson, Salina, Kan., are consulting engineers.

Omro, Wis., is arranging early special election to approve pipe lines for water system and other waterworks installation. Cost about $125,000. Jerry Donohue Engineering Co., 608 North Eighth Street, Sheboygan, Wis., is consulting engineer.

Board of Public Works, Columbus, Ind., Fred C. Owen, chairman, plans expansion and improvements in pipe lines for water system, including about 13,850 ft. of 12-in., 2086 ft. of 10-in., 14,500 ft. of 8-in., 5320 ft. of 6-in., and 3500 ft. of 4-in.; also new steam turbine and generator unit, diesel engine pumping unit and accessories, water softener, 400,000-gal. elevated steel tank and tower, and accessory equipment. Cost about $400,000. Surveys are being made by Russell B. Moore & Co., Indiana Pythian Building, Indianapolis, consulting engineers.

White Settlement Community, Fort Worth, Tex., care of J. J. Rady, Majestic Building, consulting engineer, now being established near city in connection with new aircraft bomber-manufacturing plant of Federal government, on which work is under way, plans water pipe line system. Cost about $40,000. Engineer noted is in charge.

Whittier, Cal., has awarded 122 tons of 6-in. pipe to American Cast Iron Pipe Co., Los Angeles.

Aberdeen, Wash., has opened bids on 105 tons of 6, 8, and 10-in. pipe.

Burbank, Cal., has opened bids on 233 tons of 6, 8 and 10-in. pipe.

San Diego, Cal., has opened bids on 3250 tons of 16 and 24-in. pipe, valves, and fittings.

United States Engineer, Los Angeles, will open bids April 21 for construction of sewer, water, and gas systems at Las Vegas, Nev., airport (Invitation 155) involving 150 ft. of 12-in., 4600 ft. of 10-in., 12,900 ft. of 8-in., 10,600 ft. of 6-in., 800 ft. of 3-in., and 2350 ft. of 2-in. cast iron pipe; also gas pipe with steel or cast iron alternate.

Pasadena, Cal., will open bids April 25 on 377 tons of 6, 8, and 12-in. class 150 bell and spigot pipe.

Pipe Lines

Bay Pipeline Corp., Essexville, Mich., affiliated with Bay Refining Corp., same place, plans new 4-in. welded steel pipe line from oil field in Adams Township, Arenac County, to main pipe line of company from Buckeye oil field, for crude oil transmission, increasing present supply for oil refinery at Essexville.

United Gas Pipe Line Co., Shreveport, La., has awarded contract to N. A. Saigh, Builders' Exchange Building, San Antonio, Tex., for new welded steel pipe line from point near DeQuincy, La., to Leesville and Camp Polk, La., about 28½ miles, for natural gas transmission. About 21½ miles will be 8-in., and remainder, 4-in.

Commanding Officer, Rock Island Arsenal, Rock Island, Ill., asks bids until April 21 for two lots of welded steel pipe, 45,450 ft., and 14,910 ft., respectively, and for 8670 ft. of seamless steel pipe (Circular 1433).

Anchor-Hocking Glass Corp., Lancaster, Ohio, plans new welded steel pipe line from Ravenswood gas field, near Sandyville, W. Va., to Lancaster, close to 90 miles, for natural gas transmission for service at two glass-manufacturing plants at latter place. Cost close to $1,000,000, with booster stations and other facilities.

Pine Mountain Fuel Gas Corp., Barbourville, Ky., has plans for welded steel pipe line from Hilmer gas field, Knox County, Ky., to Middlesboro, Ky., about 18 miles, for natural gas transmission for distribution at latter place, where distributing pipe lines, control house, meter station and other operating facilities will be installed. Cost over $360,000. Work will be carried out by company forces.

Magnolia Petroleum Co., Magnolia Building, Dallas, Tex., has divided an order for about 28,000 tons of welded steel pipe between Republic Steel Corp. and National Tube Co., for new line from oil field on Jim West Ranch, near Houston, Tex., to Beaumont, Tex., for crude oil transmission to company refinery at last noted place.

Construction Quartermaster, Ellington Field, Houston, Tex., has let contract to Aqua Systems, Inc., 385 Gerard Avenue, New York, at $175,000 for pressure pipe line system for natural gas transmission and distribution at local field, comprising 6 and 8-in. main lines and 1 and 2-in. laterals, with booster station, control facilities, etc.

Prices of Finished Iron and Steel...

Steel prices on these pages are f.o.b. basing points (in cents per lb.) unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases freight absorbed to meet competition.

Basing Point → / ↓ Product	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
SHEETS															
Hot rolled	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢		2.65¢	2.20¢	2.34¢	2.27¢
Cold rolled[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢		3.70¢	3.15¢	3.39¢	3.37¢
Galvanized (24 ga.)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢		4.05¢		3.74¢	3.67¢
Enameling (20 ga.)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢		4.00¢	3.45¢	3.71¢	
Long ternes[2]	3.80¢		3.80¢									4.55¢			
Wrought iron	4.75¢														
STRIP															
Hot rolled[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢		2.75¢	2.20¢		
Cold rolled[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)					2.90¢		
Cooperage stock	2.20¢	2.20¢			2.20¢		2.20¢								
Commodity C-R	2.95¢			2.95¢			2.95¢	(Worcester = 3.35¢)					3.05¢		
TIN PLATE Standard cokes (Per 100-lb. base box)	$5.00	$5.00	$5.00						$5.10						
BLACK PLATE 29 gage[5]	3.05¢	3.05¢	3.05¢						3.15¢			4.05¢ (10)			
TERNES, M'FG. Special coated (Per base box)	$4.30		$4.30						$4.40						
BARS															
Carbon steel	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢	2.80¢	2.25¢	2.49¢	2.47¢
Rail steel[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢	2.80¢			
Reinforcing (billet)[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢	2.55¢	2.25¢		
Reinforcing (rail)[7]	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢	2.05¢				2.40¢	2.45¢	2.15¢		
Cold finished[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit = 2.70¢)						
PLATES															
Carbon steel	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢	(Coatesville and Claymont = 2.10¢)		2.45¢	2.65¢		2.29¢	2.15¢
Wrought iron	3.80¢														
Floor plates	3.35¢	3.35¢									3.70¢	4.00¢		3.71¢	
Alloy	3.50¢	3.50¢			(Coatesville = 3.50¢)										
SHAPES															
Structural	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢	2.75¢		2.27¢	2.215¢
SPRING STEEL C-R															
0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)								
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)								
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)								
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)								
WIRE[9]															
Bright	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Galvanized	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)								
Spring	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)								
PILING															
Steel sheet	2.40¢	2.40¢				2.40¢						2.95¢			
IRON BARS															
Common		2.25¢			(Terre Haute, Ind. = 2.15¢)										
Refined	3.75¢														
Wrought	4.40¢														

[1] Mill run sheets are 10c. per 100 lb. less than base; and primes only, 25c. above base. [2] Unassorted 8-lb. coating. [3] Widths up to 12 in. [4] Carbon 0.25 per cent and less. [5] Applies to 29 gage within certain width and length limitations. [6] For merchant trade. [7] Straight lengths as quoted by distributers. [8] Also shafting. For quantities of 20,000 to 39,999 lb. [9] Carload lots to manufacturing trade. [10] Boxed.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are $2 higher f.o.b. Duluth, billets only, $2 higher.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

Shell Steel

Basic open hearth shell steel f.o.b. Pittsburgh and Chicago.

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting to length, or quantity. This type of steel is for hot rolled sections used for the forging of shells and includes rounds, round squares, and special sections.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)	*Per Lb.*
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., $3 a net ton higher. Quantity extras apply.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh; Package, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00
25-lb. coating I.C.	8.00	16.00
30-lb. coating I.C.	8.63	17.25
40-lb. coating I.C.	9.75	19.50

WIRE PRODUCTS

(To the Trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham)

	Base per Keg
Standard wire nails	$2.55
Coated nails	2.55
Cut nails, carloads	3.85
	Base per 100 Lb.
Annealed fence wire	$3.05
	Base Column
Woven wire fence*	67
Fence posts (carloads)	69
Single loop bale ties	59
Galvanized barbed wire†	70
Twisted barbless wire	70

*15½ gage and heavier. †On 80-rod spools in carload quantities.

Note: Birmingham base same on above items, except spring wire.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
Machine and carriage bolts:	
½ in. and smaller by 6 in. and shorter	68
9/16 and ⅝ in. by 6 in. and shorter	66
¾ to 1 in. by 6 in. and shorter	64
1⅛ in. and larger, all lengths	62
All diameters over 6 in. long	62
Lag, all sizes	65
Plow bolts	68½
Hot pressed nuts; c.p.c., t-nuts; square, hex., blank or tapped:	
½ in. and smaller	66
9/16 to 1 in. inclusive	63
1⅛ to 1½ in. inclusive	61
1⅝ in. and larger	60

On above items, excepting plow bolts, additional allowance of 10 per cent for full container quantities.

On all of the above items there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts	U.S.S.	S.A.E.
½ in. and smaller	66	70
9/16 to 1 in.	63	65
1⅛ in. through 1½ in.	61	62
1⅝ in. and larger	60	

In full container lots, 10 per cent additional discount.

Stove bolts, packages, nuts loose	73 and 100
Stove bolts in packages, with nuts attached	73
Stove bolts in bulk	81

On stove bolts freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago, New York, lots of 200 lb. or over.

Large Rivets

(½ in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.40

Small Rivets

(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 10

Cap and Set Screws

	Per Cent Off List
Milled hexagon head, cap screws, 1 in. dia. and smaller	50
Milled headless set screws, cut thread ¼ in. and larger	64
3/16 in. and smaller	73
Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller	68
Upset set screws, cup and oval points	74
Milled studs	52

Freight allowed up to 65c. per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

NON-FERROUS PRICES

Cents per lb. for early delivery

	Apr. 9	Apr. 10	Apr. 11	Apr. 12	Apr. 14	Apr. 15
Copper, Electrolytic[1]	12.00	12.00	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00	12.00	12.00
Tin, Straits, New York[2]	51.625	51.75	51.75	....	52.00	52.125
Zinc, East St. Louis	7.25	7.25	7.25	7.25	7.25	7.25
Lead, St. Louis[3]	5.70	5.70	5.70	5.70	5.70	5.70

[1] Mine producers' quotations only, delivered Conn. Valley. Deduct ¼c. for approximate New York delivery price. [2] Add 0.39c. for New York delivery. [3] Add 0.15c. for New York delivery.

Warehouse Products

Cents per lb., Delivered

	New York	Cleveland
Tin		
Straits pig	53.25	55.00
Copper		
Electro	13.00	14.50
Castings	12.50	13.50
H. R. Sheets*	20.12	20.12
Seamless tubes*	20.62	20.62
Brass		
Yellow sheets*	18.65	18.65
Yellow, rods*	13.67	13.67
Seamless tubes*	21.40	21.40
Zinc		
Slabs	Nom'al	Nom'al
Sheet, No. 9 casks	Nom'al	Nom'al
Lead		
American pig	6.85	6.35
Bar	8.70	8.85
Cut sheets	9.00	9.10
Antimony		
Asiatic	16.00	17.00
Aluminum		
Virgin, 99%	20.00	21.00
No. 1 remelt., 98-99%	18.00	18.50
Solder		
½ and ½	32.00	32.75
Babbitt		
Anti-friction grade	23.50	21.75

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their use.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper		
Hvy crucible	10.375	11.00
Hvy. and wire	9,375	9.775
Light and bottoms	8.375	8.875
Brass		
Heavy	6.125	6.625
Light	5.125	5.875
No. 1 yel. turn	5.875	6.375
No. 1 red or compo. turnings	9.125	10.125
Hvy. Mach. compo.	9.50	9.725
Lead		
Heavy	5.00	5.50
Aluminum		
Cast	11.00-12.00	
Sheet	12.00-13.50	
Zinc	5.10	

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered: virgin, 99 per cent plus, 17c.-18c. a lb.; No. 12 remelt No. 2, standard, 16c. a lb. NICKEL electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt: Asiatic, 16.50c. a lb., New York: American, 13c. a lb., f.o.b. smelter. QUICKSILVER, $181-$183, per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 13.25c. a lb.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33⅓; on brass sheets and rods, 40; on brass tubes, 33⅓, and copper tubes, 40.

ALLOY STEEL

Alloy Steel Blooms, Billets and Slabs

Base per gross ton, f.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo or Bethlehem $54.00

Alloy Steel Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade ..... 2.70c.
Delivered, Detroit ..... 2.80c.

S.A.E. Series Numbers	Alloy Differential, per 100 Lb.
2000 (1.5 Ni)	$0.35
2100 (1.5 Ni)	0.75
2300 (3.5 Ni)	1.70
2500 (5 Ni)	2.55
3100 Ni-Cr	0.70
3200 Ni-Cr	1.35
3300 Ni-Cr	3.80
3400 Ni-Cr	3.20
4100 Cr-Mo (0.15 to 0.25 Mo.)	0.55
4100 Cr-Mo (0.25 to 0.40 Mo.)	0.75
x4340 Cr-Ni-Mo	1.70
4340 Cr-Ni-Mo	1.85
4600 Ni-Mo (0.2-0.3 Mo, 1.5-2 Ni)	1.20
5100 (0.60-0.90 Cr)	0.35
5100 (0.80-1.10 Cr)	0.45
5100 Cr spring steel	0.15
52-100 Cr. (electric furnace)	2.60
6100 Cr-V bar	1.20
6100 Cr-V spring steel	0.35
C-V	0.85

The above differentials are for hot rolled finished products. The differential for most grades in electric furnace steel is 50c. higher. Slabs with a section area of 16 in. and 2½ in. thick or over take the billet base.

Alloy Cold-Finished Bars

Base per pound, f.o.b. Pittsburgh, Chicago, Gary, Cleveland or Buffalo, 3.35c. Delivered Detroit, 3.45c. carlots.

Alloy Steel Plates

Base per lb., f.o.b. Pittsburgh, Chicago and Coatesville.

Open hearth grade 3.50c

STAINLESS AND HEAT-RESISTANT ALLOYS

(Base prices, cents per lb., f.o.b. Pittsburgh)

Chromium-Nickel

No.	304	302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium

No.	410	430	442	446
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
H'tstrip	17.00c.	17.50c.	24.00c.	35.00c.
C'ld st.	22.00c.	22.50c.	32.00c.	52.00c.

20% Chromium-Nickel Clad Steel

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

TOOL STEEL

(F.o.b. Pittsburgh)

	Base per Lb.
High speed	67c.
High-carbon-chromium	43c.
Oil-hardening	24c.
Special	22c.
Extra	18c.
Regular	14c.

Prices for warehouse distribution to all points on or East of Mississippi River are 2c. a lb. higher. West of Mississippi quotations are 3c. a lb. higher.

ELECTRICAL SHEETS

(F.o.b. Pittsburgh)

	Base per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

Silicon strip in coils—Sheet price plus silicon sheet extra width extra plus 25c. per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

CAST IRON WATER PIPE

Per Net Ton

6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. dock, San Francisco or Los Angeles or Seattle	56.00

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is $45 at Birmingham and $53.80 delivered Chicago.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall

(Net base prices per 100 ft., f.o.b. Pittsburgh, in carload lots)

	Seamless Cold Drawn	Seamless Hot Rolled	Lap Weld, Hot Rolled
1 in. o.d. 13 B.W.G.	$9.01	$7.82	....
1¼ in. o.d. 13 B.W.G.	10.67	9.26	....
1½ in. o.d. 13 B.W.G.	11.70	10.23	$9.72
1¾ in. o.d. 13 B.W.G.	13.42	11.64	11.06
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2¼ in. o.d. 13 B.W.G.	16.76	14.54	13.79
2¼ in. o.d. 12 B.W.G.	18.45	16.01	15.16
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
2¾ in. o.d. 12 B.W.G.	21.42	18.59	17.54
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66
4½ in. o.d. 10 B.W.G.	43.04	37.35	35.22
5 in. o.d. 9 B.W.G.	54.01	46.87	44.25
6 in. o.d. 7 B.W.G.	82.93	71.96	68.14

Extras for less carload quantities:

40,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb .or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought iron pipe)

Base Price = $200 Per Net Ton

Butt Weld

Steel	Black	Galv.
⅛ in.	56	33
¼ to ⅜ in.	59	40½
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron	Black	Galv.
¼ and ⅜ in.	+9	+33
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18

Lap Weld

Steel		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
7 and 8 in.	65	52½
9 and 10 in.	64½	52
11 and 12 in.	63½	51
Wrought Iron		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
9 to 12 in.	28½	12

Butt weld, extra strong, plain ends

Steel	Black	Galv.
⅛ in.	54½	38½
¼ to ⅜ in.	56½	42½
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron		
¼ and ⅜ in.	+10	+46
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½

Lap weld, extra strong, plain ends

Steel		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
7 and 8 in.	65½	53
9 and 10 in.	64½	52
11 and 12 in.	63½	51
Wrought Iron		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21
7 and 8 in.	38½	21½
9 to 12 in.	32	17½

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher, on all butt weld 8 in. and smaller.

ORES

Lake Superior Ores
Delivered Lower Lake Ports

	Per Gross Ton
Old range, bessemer, 51.50%...	$4.75
Old range, non-bessemer, 51.50%	4.60
Mesaba, bessemer, 51.50%.....	4.60
Mesaba, non-bessemer, 51.50%.	4.45
High phosphorus, 51.50%.....	4.35

Foreign Ores*
C.i.f. Philadelphia or Baltimore, Exclusive of Duty

	Per Unit
African, Indian, 44 to 48% Mn.	57c. to 61c.
African, Indian, 49 to 51% Mn.	60c. to 65c.
Brazilian, 46 to 48% Mn...54c. to 59c.	
Cuban, del'd, duty free, 51% Mn.	67½c. to 71c.

	Per Short Ton Unit
Tungsten, Chinese, Wolframite, duty paid, delivered.....$23 to $24	
Tungsten, domestic, scheelite, delivered	$23.00
Chrome ore, lump c.i.f. Atlantic Seaboard, per gross ton: South African (low grade).....	Nom.
Rhodesian, 45%	$25.00
Rhodesian, 48% ....$28.00 to	$30.00

RAILS, TRACK SUPPLIES

	F.o.b. Mill
Standard rails, heavier than 60 lb., gross ton.....	$40.00
Angle bars, 100 lb.....	2.70
F.o.b. Basing Points	
Light rails (from billets), gross ton	$40.00
Light rails (from rail steel), gross ton	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	4.55c.
Tie plates, steel.....	2.15c.
Tie plates, Pacific Coast.....	2.30c.
Track bolts, steam railroads...	4.15c.
Track bolts, discount to jobbers all sizes (per 100 counts)....	65-5

Basing points, light rails—Pittsburgh, Chicago, Birmingham; spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minneaqua, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo; spikes alone—Youngstown, Lebanon, Pa., Richmond, Va.

FLUORSPAR *Per Net Ton*

Domestic washed gravel, 85-5 f.o.b. Kentucky and Illinois mines, all rail...$20.00 to	$21.00
Domestic, f.o.b. Ohio River landing barges .....20.00 to	21.00
No. 2 lump, 85-5 f.o.b. Kentucky and Illinois mines...20.00 to	21.00
Foreign, 85% calcium fluoride, not over 5% Si., c.i.f. Atlantic ports, duty paid.....	Nominal
Domestic No. 1 ground bulk, 96 to 98%, calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines....	31.00
As above, in bags, f.o.b. same mines	32.60

REFRACTORIES

Fire Clay Brick	*Per 1000 f.o.b. Works*
Super-duty brick at St. Louis..$60.80	
First quality Pennsylvania, Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey....	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois.....	42.75
Second quality, New Jersey....	49.00
No. 1 Ohio.....	39.90
Ground fire clay, per ton.....	7.10
Silica Brick	
Pennsylvania	$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement, net ton (Eastern)	8.55

Chrome Brick	*Net per Ton*
Standard f.o.b. Baltimore, Plymouth Meeting and Chester...$50.00	
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	
Magnesite Brick	
Standard f.o.b. Baltimore and Chester $72.00	
Chemically bonded, f.o.b. Baltimore	61.00
Grain Magnesite	
Imported, f.o.b. Baltimore and Chester, Pa. (in sacks).....(—)*	
Domestic, f.o.b. Baltimore and Chester in sacks $40.00	
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

*None available.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload).....$120.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21%.....$36.00
Domestic, 26 to 28%..... ... 49.50

Electric Ferrosilicon

Per Gross Ton, Delivered, Lump Size

50% (carload lots, bulk).....$74.50*
50% (ton lots, packed..... 87.00*
75% (carload lots, bulk).....135.00*
75% (ton lots, packed).....151.00*

Bessemer Ferrosilicon

Per Gross Ton, F.o.b. Jackson, Ohio

10.00 to 10.50%.....$34.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.
For each unit of manganese over 2% $1 per ton additional.
Base prices at Buffalo are $1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton, F.o.b. Jackson, Ohio

5.00 to 5.50%.....$28.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.
The lower all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are $1.25 a ton higher than at Jackson.
Manganese, each unit over 2%, $1 a ton additional. Phosphorus 0.75% or over, $1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots Lump Size, on Contract

4 to 6% carbon.....11.00c.
2% carbon .....17.50c.
1% carbon .....18.50c.
0.10% carbon .....20.50c.
0.06% carbon .....21.00c.

Spot prices are ¼c. per lb. of contained chromium higher.

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

8% carbon $113.00*
2.50% carbon 118.00*
2% carbon 123.00*
1% carbon 133.00*

Other Ferroalloys

Ferrotungsten, per lb. contained W, del. carload..... $2.00
Ferrotungsten, 100 lb. and less 2.25
Ferrovanadium, contract, per lb. contained V, del'd $2.70 to $2.90†
Ferrocolumbium, per lb. contained columbium f.o.b. Niagara Falls, N. Y., ton lots ..... $2.25†
Ferrocarbontitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace, carload and contract, per net ton.....$142.50
Ferrocarbontitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract per net ton.....$157.50

*Spot prices are $5 per ton higher.
†Spot prices are 10c. per lb. of contained element higher.

Ferrophosphorus, electric or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with $3 unitage, freight equalized with Rockdale, Tenn., per gross ton 58.50

Ferrophosphorus, electrolytic 23-26% in carlots, f.o.b. Monsato (Siglo), Tenn., 24%, per gross ton, $3 unitage, freight equalized with Nashville 75.00

Ferromolybdenum, per lb. Mo, f.o.b. furnace ..... 95c.

Calcium molybdate, per lb. Mo, f.o.b. furnace ..... 80c.
Molybdenum oxide briquettes 48-52% Mo, per lb. contained Mo, f.o.b. Langeloth, Pa. 80c.

FUEL OIL

No. 3, f.o.b. Bayonne, N. J.....4.50c.
No. 6, f.o.b. Bayonne, N. J.....2.98c.
No. 5 Bur. Stds., del'd Chicago..3.25c.
No. 6 Bur. Stds., del'd Chicago..2.75c.
No. 3 distillate, del'd Cleveland..5.50c.
No. 4 industrial, del'd Cleveland.5.25c.
No. 5 indus., del'd Cleveland...5.125c.
No. 6 indus., del'd Cleveland...4.875c.

COKE

Per Net Ton

Furnace, f.o.b. Connellsville, prompt .....$5.50 to $5.75

Foundry, f.o.b. Connellsville, prompt .....$6.00 to $6.50

F'dry, by-product, Chicago..... 10.50

F'dry, by-product, New England 13.00

Foundry, by-product, Newark or Jersey City .....$11.30 to $11.90

F'dry, by-product, Philadelphia. 11.63

F'dry, by-product, Cleveland... 11.55

F'dry, by-product, Cincinnati... 11.00

Foundry, Birmingham 7.50

F'dry, by-product, St. Louis $10.75 to $11.00

BRITISH

Per Gross Ton, f.o.b. United Kingdom Ports

Ferromanganese, export £29 16s. 3d.

Tin plate, per base box. 32s. to 33s.

Steel bars, open hearth..£16 10s.

Beams, open hearth....£19 10s.

Channels, open hearth..£19 10s.

Angles, open hearth....£15 10s.

Black sheets, No. 24, gage £22 5s. max.* £22 5s. min.**

Galvanized sheets, No. 24 gage £25 12s. 6d. max.*; £25 12s. 6d. min.**

*Empire markets only.
**Other than Empire markets.

PIG IRON (Per Gross Ton)

Prices delivered various consuming points indicated by bold italics

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos.
Boston	***$25.50***	***$25.00***	***$26.50***	***$26.00***	.....
Brooklyn	***27.50***	.....	.....	***28.00***	.....
Jersey City	***26.53***	***26.03***	***27.53***	***27.03***	.....
Philadelphia	***25.84***	***25.34***	***26.84***	***26.34***	.....
Bethlehem, Pa.	$25.00	$24.50	$26.00	$25.50	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50
Birdsboro, Pa.	25.00	24.50	26.00	25.50	29.50
Sparrows Point, Md.	25.00	24.50	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....
Sharpsville, Pa.††	24.00	23.50	24.50	24.00	.....
Buffalo	24.00	23.00	25.00	24.50	29.50
Cincinnati	***24.44***	***24.61***	.....	***25.11***	.....
Canton, Ohio	***25.39***	***24.89***	***25.89***	***25.39***	.....
Mansfield, Ohio	***25.94***	***25.44***	***26.44***	***25.94***	.....
St. Louis	***24.50***	***24.02***	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	.....
Granite City, Ill.	24.00	23.50	24.50	24.00	.....
Cleveland	24.00	23.50	24.50	24.00	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....
Toledo	24.00	23.50	24.50	24.00	.....
Youngstown††	24.00	23.50	24.50	24.00	.....
Detroit	24.00	23.50	24.50	24.00	.....
St. Paul	***26.63***	.....	***27.13***	***26.63***	.....
Duluth	24.50	.....	25.00	24.50	.....
Birmingham	20.38	19.00	25.00	.....	.....
Los Angeles, San Francisco and Seattle	***27.50***	.....	.....	.....	.....
Provo, Utah	22.00	.....	.....	.....	.....
Montreal†	27.50	27.50	.....	28.00	.....
Toronto†	25.50	25.50	.....	26.00	....

GRAY FORGE

Valley or Pittsburgh fce.....$23.50

CHARCOAL

Lake Superior fce.....$27.00
Delivered Chicago 30.34

Base prices are subject to an additional charge for delivery within the switching limits of the respective districts.

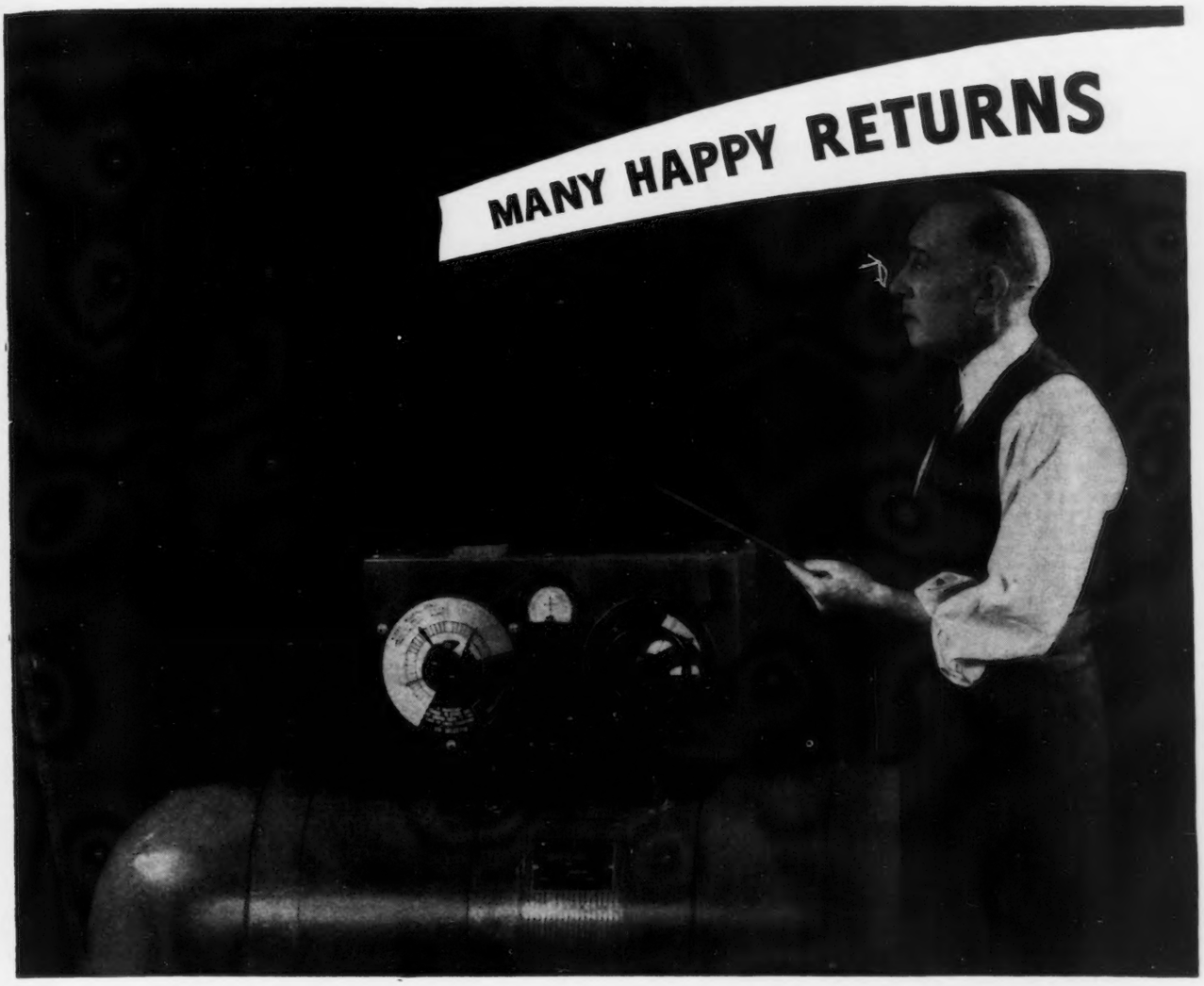
Delivered prices on Southern iron for shipment to Northern points are 38c. a ton below delivered prices from nearest Northern basing point on iron with phosphorus content of 0.70 per cent and over. †On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

††Pittsburgh Coke & Iron and Struthers furnaces are quoting $24.50 a ton for No. 2 foundry, basic and malleable, and $25.00 a ton for bessemer iron at Sharpsville and Youngstown.

WAREHOUSE PRICES

	Pittsburgh	Chicago	Cleveland	Philadelphia	New York	Detroit	Buffalo	Boston	Birmingham	St. Louis	St Paul	Milwaukee	Los Angeles
Sheets, hot rolled	$3.35	$3.05	$3.35	$3.75	$3.58	$3.23	$3.25	$3.71	$3.45	$3.39	$3.30	$3.38	$4.30
Sheets, cold rolled	....	4.10	4.05	4.05	4.40	4.30	4.30	3.68	....	4.12	4.35	4.23	6.50
Sheets, galvanized	4.75	4.60	4.62	4.90	5.00	4.64	4.75	5.11	4.75	4.87	4.75	4.98	5.25
Strip, hot rolled	3.60	3.40	3.50	3.95	3.96	3.48*	3.82	4.06	3.70	3.74	3.65	3.73	....
Strip, cold rolled	3.20	3.30	3.20	3.31	3.51	3.20	3.52	3.46	....	3.61	3.83	3.54	....
Plates	3.40	3.55	3.40	3.75	3.76	3.60	3.62	3.85	3.35	3.69	3.80	3.68	4.15
Structural shapes	3.40	3.55	3.58	3.75	3.75	3.65	3.40	3.85	3.55	3.69	3.80	3.68	4.15
Bars, hot rolled	3.35	3 50	3.25	3.85	3.84	3.43	3.35	3.98	3.50	3.64	3.75	3.63	4.15
Bars, cold finished	3.65	3.75	3.75	4.06	4.09	3.80	3.75	4.13	4.43	4.02	4.34	3.88	6.60
Bars, ht. rld. SAE 2300	7.20	7.10	7.55	7.31	7.60	7.42	7.35	7.50	....	7.72	7.45	7.58	9.55
Bars, ht. rld. SAE 3100	5.75	5.65	5.85	5.86	5.90	5.97	5.65	6.05	....	6.02	6.00	5.88	8.55
Bars, cd. drn. SAE 2300	8.15	8.15	8.40	8.56	8.84	8.45	8.40	8.63	....	8.77	8.84	8.63	10.55
Bars, cd. drn. SAE 3100	6.75	6.75	7.75	7.16	7.19	7.05	6.75	7.23	....	7.12	7.44	6 98	9.55

BASE QUANTITIES: Hot rolled sheets, cold rolled sheets, hot rolled strip, plates, shapes and hot rolled bars, 400 to 1999 lb.; galvanized sheets, 150 to 1499 lb.; cold rolled strip, extras apply on all quantities; cold finished bars, 1500 lb. and over; SAE bars, 1000 lb. and over. Exceptions: Chicago, galvanized sheets, 500 to 1499 lb.; Philadelphia, galvanized sheets, one to nine bundles, cold rolled sheets, 1000 to 1999 lb.; Detroit, galvanized sheets, 500 to 1499 lb.; Buffalo, cold rolled sheets, 500 to 1500 lb., galvanized sheets, 450 to 1499 lb., cold rolled strip, 0.0971 in. thick; Boston, cold rolled and galvanized sheets, 450 to 3749 lb.; Birmingham, hot rolled sheets, strip and bars, plates and shapes, 400 to 3999 lb., galvanized sheets, 500 to 1499 lb.; St. Louis, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb.; Milwaukee, cold rolled sheets, 400 to 1499 lb., galvanized sheets, 500 to 1499 lb.; New York, hot rolled sheets, 0 to 1999 lb., cold rolled sheets, 400 to 1499 lb.; St. Paul, galvanized and cold rolled sheets, any quantity, hot rolled bars, plates, shapes, hot rolled sheets, 400 to 14,999 lb.; Los Angeles, hot rolled sheets, bars, plates, shapes, cold rolled sheets, 300 to 1999 lb., galvanized sheets, 24 ga.—1 to 6 bundles. Extras for size, quality, etc., apply on above quotations. *12 gage and heavier, $3.23.



ALTER EGO: Literally "one's other self"—the still, small voice that questions, inspires and corrects our conscious action.

ALTER EGO: Don't you think mebbe we could relieve the production jam by replacing those old weld jaloppies with NEW welders?

Sure, but then we'd flop right back into a financial jam . . . don't let's spend money.

ALTER EGO: But AREN'T we spending? . . . aren't we spending in excessive welding costs for every welder that isn't of modern design?

Well, they do *claim the new Lincoln is faster.*

ALTER EGO: S'pose it boosts our speed 10%. That'll save us about $200 per year per welder.

Sounds good.

ALTER EGO: And s'pose we increase our speed not 10% but 20% or more—like some Lincoln users have—with Lincoln Welders PLUS Lincoln Service?

That would *be Many Happy Returns on our spending—and we'd be out of the jam in the bargain.* How *do we do it?*

• •

LINCOLN SUGGESTS: Ability to withstand the heavier loads is one reason the New "Shield-Arc" is *faster.* It permits use of larger electrodes. By stepping up electrode size from ¼" to $\frac{5}{16}$", one user increased welding speed 43%—cut cost 25c per pound deposited. What can *you* do? All "Shield-Arc" features are explained in Bulletin 412 (gratis).

LINCOLN "SHIELD-ARC" WELDING THE LINCOLN ELECTRIC COMPANY Cleveland, Ohio

Largest Manufacturers of Arc Welding Equipment in the World

Sales Possibilities

. . . CONSTRUCTION, PLANT EXPANSION AND EQUIPMENT BUYING

North Atlantic States

● **Remington Arms Co., Inc.,** Bridgeport, Conn., has let general contract to Edwin Moss & Son, Inc., 555 Grant Street, for one-story addition, 100 x 338 ft., with wing extension, 36 x 51 ft. Cost close to $200,000 with equipment.

Brown & Sharpe Mfg. Co., Providence, R. I., plans one-story addition, 130 x 245 ft. Cost about $165,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, plans expansion and improvements in naval torpedo station, Newport, R. I., including buildings and equipment for increased capacity; also extensions and improvements in station power plant, including equipment. Cost about $2,855,000. Appropriation in that amount is being arranged.

American Steel & Wire Co., Worcester, Mass., has taken out a permit for two one-story additions to be equipped as a wire strip mill, cost about $850,000 with equipment; and extension to building No. 230, used as a copper wire mill, cost about $115,000 with equipment. This is part of expansion program under way at plant. Award for foundations for buildings noted has been let to J. B. Lowell Co., Inc., 44 Portland Street.

Pratt & Whitney Division, United Aircraft Corp., East Hartford, Conn., aircraft engines and parts, will carry out further expansion for production for Government, which has authorized fund of about $9,607,000 for buildings, machinery and equipment, increasing Federal appropriations for plant development to $18,321,000.

Electro Metallurgical Co., and Union Carbide Co., both 30 East Forty-second Street, New York, associated units of Union Carbide & Carbon Corp., have purchased tract near St. Johns district, Portland, Ore., for joint plant for production of calcium carbide, ferrosilicon and other chrome-bearing alloys, to include machine shop, power substation station and auxiliary structures. Electric furnaces and accessory equipment will be installed. Company is arranging for power supply from Bonneville transmission system. Cost over $2,000,000 with equipment.

Lakeville Mfg. Co., Hicksville, N. Y., kitchen cabinets, table and sink tops, etc., has leased two-story building, about 55,000 sq. ft. of floor space, at Lindenhurst, N. Y., formerly used by Vulcanite Mfg. Co., for new plant, replacing works at first noted place recently destroyed by fire, with loss of about $75,000 including equipment.

Bureau of Yards and Docks, Navy Department, Washington, plans extensions and improvements in power plant at naval ammunition depot, Iona Island, N. Y., including equipment. Cost about $100,000. Appropriation in that amount is being arranged.

Rheem Mfg. Co., 30 Rockefeller Plaza, New York, steel barrels, drums and other steel containers, has let general contract to Brown & Matthews, Inc., 122 East Forty-second Street, for one-story addition to plant at Sparrows Point, Baltimore, 160 x 320 ft. Cost about $175,000 with equipment.

Aircraft Screw Products Co., Long Island City, a new company, has leased property at 47-23 Thirty-fifth Street for plant for production of screw machine parts for aircraft.

National Aniline & Chemical Co., 1051 South Park Avenue, Buffalo, plans one-story addition. Cost close to $150,000 with equipment. Main offices are at 40 Rector Street, New York.

Remington-Rand, Inc., 465 Washington Street, Buffalo, typewriters, metal filing cabinets and devices, etc., will take bids on general contract for three-story addition to plant No. 2 at Ilion, N. Y., 50 x 160 ft. Cost close to $150,000 with equipment. Haskell & Considine, Hulett Building, Elmira, N. Y., are architects.

Rochester Products Division, General Motors Corp., 100 Lexington Avenue, Rochester, N. Y., precision instruments and parts, is erecting one-story addition, about 15,000 sq. ft. of floor space, for which general contract recently was let to Stewart & Bennett, Inc., 126 North Water Street. It will be used for production of aircraft control instruments and parts for Government. Cost close to $100,000 with equipment. Frank M. Quinlan, 8 Exchange Street, is architect.

Davis Emergency Equipment Co., Inc., 55 Vandam Street, New York, industrial safety equipment, has leased three-story building at 45-47 Halleck Street, Newark, N. J., about 32,000 sq. ft. of floor space, for plant.

American Bridge Co., South Warren and Federal Streets, Trenton, N. J., plans one-story addition for expansion in steel fabricating works. Cost over $350,000 with equipment.

Wright Aeronautical Corp., 132 Beckwith Avenue, Paterson, N. J., will carry out further expansion in plant at East Paterson, for production of engines for Government. Cost about $1,925,000, of which $1,650,000 will be expended for machinery and equipment, and $275,000 for new one-story building. Fund will be provided by Government.

Gulton Metals Refining & Chemical Corp., Metuchen, N. J., Dr. Leslie Gulton, president, has leased former power house of Public Service Electric & Gas Co. on Durham Avenue, and will remodel for new plant for production of zinc oxide and other metallic compounds.

Welin Davit & Boat Corp., 500 Market Street, Perth Amboy, N. J., steel power boats, marine equipment, etc., has let general contract to Michael Riesz, 871 King George's Road, Fords, N. J., for one-story addition, 70 x 240 ft. Cost over $65,000 with equipment.

Bureau of Yards and Docks, Navy Department, Washington, plans expansion in Naval Aircraft Factory, Philadelphia, including one-story buildings and equipment for aircraft testing and other work. Cost about $720,000. Appropriation in that amount is being arranged.

Lukens Steel Co., Coatesville, Pa., will carry out plant expansion for production for Navy Department, including new one-story buildings and equipment, to cost about $2,400,000. Appropriation in that amount will be furnished by Government.

Heintz Mfg. Co., Front Street and Olney Avenue, Philadelphia, steel automobile bodies, radiators, etc., will proceed with superstructure for one-story addition, for expansion in machine shop, for which general contract recently was let to Lester T. Haldeman, 1718 Cherry Street. Cost close to $100,000 with equipment.

Mine Safety Appliances Co., 201 North Braddock Avenue, Pittsburgh, will modernize seven one-story buildings at Callery for new plant, including erection of three-story and basement unit, 55 x 60 ft., and boiler house. Bids are being asked on general contract. Cost over $100,000. Prack & Prack, Martin Building, Pittsburgh, are architects.

General Purchasing Officer, Panama Canal, Washington, asks bids until April 22 for 22 brass melting crucibles, 300 casting brushes, mechanic's step ladders, steel foundry nails, coach axles and other equipment (Schedule 4994).

Aircraft & Marine Specialty Co., Inc., 16 East Franklin Street, Baltimore, airplane and marine equipment, has leased three-story and basement building at Central Avenue and Fawn Street, about 45,000 sq. ft. of floor space, for plant.

Bureau of Yards and Docks, Navy Department, Washington, plans expansion at naval air station, Unalaska, Alaska, including hangars, shops, oil storage and distributing equipment and facilities, and other structures. Cost about $4,086,500; also similar expansion at naval air station at Sitka, Alaska, to cost about $500,000. Appropriations are being arranged.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until April 22 for metal clothes lockers (Schedule 6199), diesel engine combination generator, air compressor and water pump, with spare parts (Schedule 6201), 504 shell bearings (Schedule 6213), one 3½-ton, mobile type crane (Schedule 5975), boiler tubes (Schedule 6169); until April 24, wire bottoms for pipe berths, pipe berth hooks and open-box springs, helical springs (Schedule 6183) for Eastern and Western yards; until April 22, crankshafts and spare parts (Schedule 6214) for Los Angeles, San Francisco or Seattle yards; 125,000 ft. of double-conductor, oil-resisting cable (Schedule 6197), horizontal boring, drilling and milling machine (Schedule 6196) for Mare Island yard.

The South

● **Nashville Bridge Co.,** foot of Shelby Avenue, Nashville, Tenn., plans one-story addition for increase in steel fabricating works for Government orders. Cost close to $150,000 with equipment, including mechanical-handling facilities.

Quartermaster, Army and Navy General Hospital, Hot Springs National Park, Ark., asks bids until April 29 for one motor-driven lathe (Circular 400-10).

International Harvester Co., Inc., 180 North Michigan Avenue, Chicago, has leased one-story building, 100 x 180 ft., to be erected by Charles Lamar, Baton Rouge, La., at Florida and Live Oak Streets, Baton Rouge, for new factory branch, storage and distributing plant. Cost close to $75,000 with equipment. Contract for erection has been let to LeBlanc Brothers, Inc., Louisiana National Bank Building, Baton Rouge.

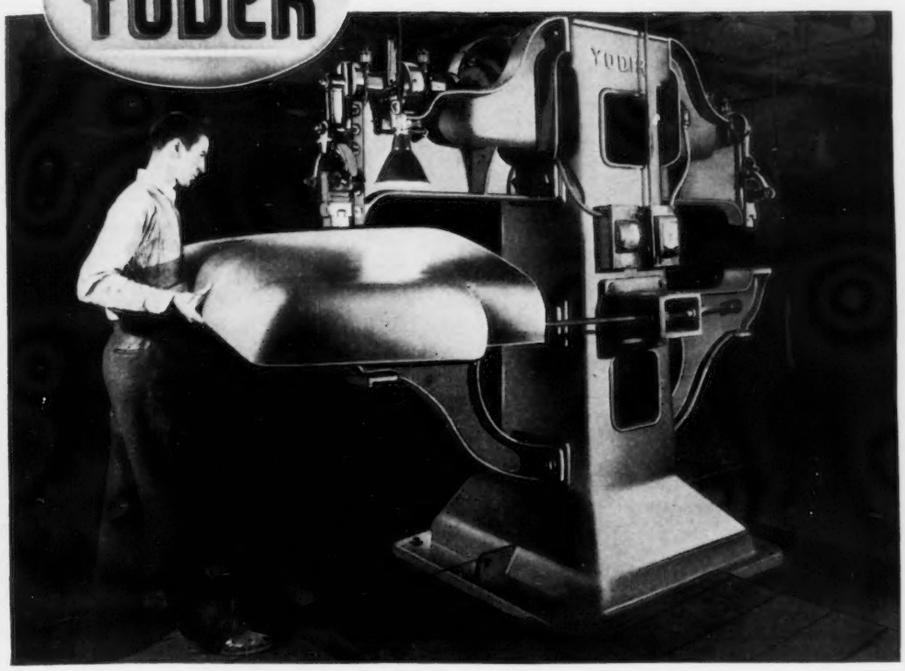
United States Engineer Office, Mobile, Ala., asks bids until April 24 for steam power plant at Brookley Field, Southeast Air Depot, Mobile, including three portable or semi-portable horizontal return tubular boilers, each 150-hp., fired with combination gas-oil burners, feedwater heater, oil storage tanks and auxiliary equipment; also for 90-ft. radial brick stack (Circular 317).

Delta Refining Co., Memphis, Tenn., R. B. Smith, Parkview Hotel, head, recently organized, plans new oil refinery on West Mallory Street, Riverside Park district, on 13-acre tract, for production of gas oil and residue fuel oils, with cracking department for gasoline production. Steel tank storage and loading terminal facilities will be installed. Cost over $350,000 with equipment.

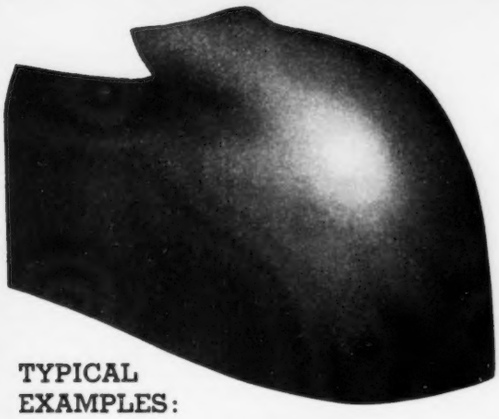
Bureau of Yards and Docks, Navy Department, Washington, plans expansion at naval air station, Charleston, S. C., including hangars, shops and other mechanical buildings, with facilities for airplane maintenance and repair. Cost about $950,000. Appropriation in that amount is being arranged.

Monongahela-West Penn Public Service Co., Fairmont, W. Va., plans addition to steam-electric generating plant at Rivesville, W. Va., with installation of new 35,000-kw. turbine-generator unit and accessories; high-pressure boiler with rating of 400,000 lb. of steam per hour, to be fired with pulverized coal; and auxiliary equipment. Switchyard will be enlarged and transmission lines extended for power service for plants in vicinity. Cost over $3,500,000.

YODER POWER HAMMERS



for the *fast, efficient, cold forming* of large sheet metal parts



TYPICAL EXAMPLES:

Top — Roof of a sleeper cab.

Above — Fender of streamlined locomotive, approximately 4½ x 7 feet.

Below — Front section for C.O.E. cab with moulding to receive windshield.

Yoder High Speed Power Hammers, widely used for the cold forming of sheet metal, are particularly well suited for the production of parts under conditions that do not permit the delay or justify the expense that would be entailed in making dies.

With a simple wooden form as a guide, the operator puts this versatile hammer "through its paces" and forms accurately fitting fenders, cab tops, airplane parts, etc., with remarkable speed and efficiency.

Blows of varying force, up to 1200 per minute may be applied through operation of the simple slip type cone clutch. A leaf spring cushions the stroke on the upward movement and intensifies the blow on the downward stroke.

Two sizes of hammers are available: the LK — 90M with 2 H.P. 1200 R.P.M. motor and 65 lb. stroke, and the K — 90M — with 3 H.P. 1200 R.P.M. motor and 125 pound stroke.

If you form sheet metal it will be to your interest to investigate these hammers at once.

THE YODER COMPANY

5500 WALWORTH AVENUE
CLEVELAND, OHIO

YODER MAKES:

Beading Machines - - Bending Machines - -
Brake Shoe Machines - - Tension Reels - - Coilers - - Uncoilers - - Roll-Forming Machines - -
Flying Cut-off Machines - - Slitting Lines - - Scrap Cutters - - Power Hammers - - Special Machines

City Council, Orangeburg, S. C., asks bids until May 2 for pumping station for municipal water system. Wiedeman & Singleton, Candler Building, Atlanta, Ga., are consulting engineers.

Emsco Derrick & Equipment Co., Garden Villas, Houston, Tex., oil well equipment and supplies, oil rigs, etc., has asked bids on general contract for one-story addition, 50 x 325 ft. Cost over $125,000 with equipment.

Central States

• **Acme Pattern & Tool Co.,** Findlay Street, Dayton, Ohio, has asked bids on general contract for one-story addition, 132 x 302 ft., with mezzanine floor, 40 x 132 ft., for use as a foundry. Cost over $150,000 with equipment. W. Ray Yount, Third National Bank Buiding, is architect.

Upson-Walton Co., 1310 West Eleventh Street, Cleveland, wire rope, turnbuckles, clamps, etc., has let general contract to Sam W. Emerson Co., 1836 Euclid Avenue, for new one-story plant, 120 x 300 ft., for wire rope production. Branch plant at Newark, N. J., will be removed to new structure and capacity increased. Cost over $125,000 with equipment.

Timken Roller Bearing Co., 1025 Cleveland Avenue, Columbus, Ohio, has let general contract to E. Elford & Son, Inc., 555 South Front Street, for one-story addition, 36 x 137 ft. Cost over $85,000 with equipment.

Fulton Foundry & Machine Co., East Seventy-fifth Street and Morgan Avenue, Cleveland, has asked bids on general contract for two-story addition, 25 x 80 ft. Cost close to $60,000 with equipment. Walther J. Wefel, 3327 Yorkshire Road, is architect and engineer.

City Council, Hamilton, Ohio, has plans for expansion and improvements in municipal power plant, to include new steam-generating units and auxiliary equipment; also for extensions in electrical distributing lines. Cost about $750,000. Froehlich & Emery Engineering Co., Second National Bank Building, Toledo, Ohio, is consulting engineer.

Delco-Remy Division, General Motors Corp., Anderson, Ind., automobile starting and lighting equipment, plans one-story addition, about 200,000 sq. ft. of floor space. Cost over $500,000 with equipment.

General Electric Co., Fort Wayne, Ind., plans one-story addition to local works. Cost over $85,000 with equipment.

Chase Brass & Copper Co., Waterbury, Conn., plans expansion in branch mill at 1155 Babbitt Road, Euclid, Ohio, including one-story addition and equipment for production of ammunition brass, cartridge cases and allied products for War Department. Cost about $16,000,000. Fund will be provided by Government.

Benson Mfg. Co., Eighteenth Street and Agnes Avenue, Kansas City, Mo., aircraft equipment and parts, plans one-story addition, 100 x 135 ft., for parts assembling. Cost over $100,000 with equipment. Boillot & Lauck, 1012 Baltimore Street, are architects.

Board of Education, Edgerton, Kan., plans one-story vocational shop at school. Cost close to $50,000 with equipment. Thomas W. Williamson & Co., National Bank of Topeka Building, Topeka, Kan., is architect.

Dixie Machinery Co., 4206 Goodfellow Avenue, St. Louis, grinding, crushing and pulverizing machinery and parts, has let general contract to W. C. Harting Construction Co., 722 Chestnut Street, for one-story addition, 60 x 90 ft. Cost close to $50,000 with equipment. Fred R. Nauman, 2700 North Grand Boulevard is architect.

Hunter Milling Co., Wellington, Kan., has let general contract to D. C. Bass & Son Construction Co., Enid, Okla., for new grain elevator. Cost over $75,000 with elevating, conveying, screening and other equipment. Horner & Wyatt, Board of Trade Building, Kansas City, Mo., are consulting engineers.

Union Electric Co. of Missouri, Inc., Twelfth and Locust Streets, St. Louis, has let general contract to Vernon Higbee Construction Co., 6405 Nashville Avenue, for one-story mechanical and repair shop. Cost close to $50,000 with equipment.

Briggs Mfg. Co., 11631 Mack Avenue, Detroit, steel automobile bodies, has let general contract to W. E. Wood Co., 4649 Humboldt Street, for one-story addition to plant on Connors Avenue. Cost close to $1,000,000 with equipment.

Hayes Industries, Inc., Jackson, Mich., airplane wheels and other aircraft equipment, is erecting one-story addition for storage and distribution, for which general contract recently was let to Austin Co., Cleveland. Cost about $50,000 with equipment.

Pontiac Motor Division, General Motors Corp., Pontiac, Mich., plans expansion for production of ordnance material for Government, including one-story addition and auxiliary structures. Cost about $5,700,000 with equipment. Fund in that amount will be furnished by Defense Plant Corp., Washington, Federal agency. Company has let general contract to Austin Co., Cleveland, for one-story addition for expansion in automobile plant. Cost about $100,000 with equipment.

Coca-Cola Bottling Co., 3609 Gratiot Avenue, Detroit, has let general contract to Joseph A. Krausmann Co., 1460 East Jefferson Avenue, for new two-story mechanical-bottling, storage and distributing plant, 85 x 230 ft. Cost close to $100,000 with equipment.

King-Seeley Corp., Ann Arbor, Mich., oil gages, speedometers, parts, etc., has leased local one-story building, about 15,000 sq. ft. of floor space, previously used by Elisfor Storage Co., for branch plant for production of aircraft equipment for Government.

Oak Mfg. Co., 1260 Clybourn Avenue, Chicago, radio equipment and parts, has let general contract to W. H. Lyman Construction Co., 140 South Dearborn Street, for one-story addition, 45 x 105 ft. Cost about $55,000 with equipment. Lee A. Bailey, 1100 North Dearborn Street, is consulting engineer.

Eddy Stoker Corp., 4717 West North Avenue, Chicago, stokers and parts, has asked bids on general contract for one and two-story addition, 65 x 85 ft. Cost close to $60,000 with equipment. Engineering Systems, Inc., 221 North La Salle Street, is architect and engineer.

Pullman-Standard Car Mfg. Co., 79 East Adams Street, Chicago, plans new plant on site now being secured for production of airplane parts for Government. Cost about $1,108,900 and fund in that amount will be secured through Defense Plant Corp., Washington, Federal agency.

Kenosha Boiler & Structural Co., 4117 Thirteenth Court, Kenosha, Wis., has let general contract to Larson Brothers, 7409 Fourteenth Avenue, for one-story shop addition, 20 x 135 ft. Cost close to $50,000 with equipment.

City Council, Muscatine, Iowa, asks bids until April 23 for one steam-generating unit to use pulverized coal, capacity 100,000 lb. of steam per hr., for municipal power plant; also alternate bids on steam generator of same capacity, adapted for stoker-firing, and for one multiple retort underfeed stoker. Stanley Engineering Co., Muscatine, is consulting engineer.

American Hoist & Derrick Co., 63 South Robert Street, St. Paul, Minn., plans one-story addition, 90 x 200 ft., for an erecting shop. Cost close to $90,000 with equipment. C. H. Johnston, Empire Bank Building, is architect.

Globe Steel Tubes Co., 3839 West Mitchell Street, Milwaukee, has let general contract to Gebhard-Berghammer, Inc., 5420 West State Street, for one-story addition, 60 x 400 ft., for storage and distribution. Cost over $100,000 with equipment.

John Deere Tractor Co., Waterloo, Iowa, has let general contract to Jens Oelsen & Sons Construction Co., 321 West Eighteenth Street, for addition to steam power plant, 45 x 80 ft., for which equipment awards are being made separately. Cost close to $85,000 with equipment.

Western States

• **Hardman Aircraft Co.,** 12324 Center Street, South Gate, Los Angeles, plans one-story addition on adjoining site recently acquired. Cost over $125,000 with equipment.

Pioneer-Flintkote Co., 5500 South Alameda Street, Los Angeles, roofing and building products, has let general contract to Myers Brothers, Inc., 3407 San Fernando Street, West Los Angeles, for one-story addition for storage and distribution. Cost close to $100,000 with equipment. Parkinson & Parkinson, Title Insurance Building, are architects.

Seattle-Tacoma Shipbuilding Corp., Tacoma, Wash., plans expansion to double present capacity for construction of vessels for Maritime Commission, including four new shipways, outfitting wharf, fabrication buildings, shops and other structures. Cost over $3,000,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington., asks bids until April 22 for 150 acetylene gas cylinders and 400 oxygen cylinders for Puget Sound Navy Yard (Schedule 6203).

St. Regis Kraft Co., Tacoma, Wash., pulp and paper products, has approved plans for expansion and improvements in pulp mill, including new digesters and accessory equipment, improvements in chemical recovery plant and other work. Cost about $600,000 with machinery.

Board of Education, Pasadena, Cal., plans one-story foundry on West campus of Pasadena Junior College. Cyril J. Bennett, First Trust Building, is architect.

Bureau of Yards and Docks, Navy Department, Washington, plans expansion in naval air station, San Diego, Cal., including hangars, shops and other buildings, oil storage and distribution tanks and facilities. Cost about $679,000. Appropriation in that amount is being arranged.

Northwest Steel Rolling Mills, Inc., 4315 Ninth Avenue, N. W., Seattle, has let general contract to Isaacson Iron Works, Inc., 2917 East Marginal Way, for one-story addition, 50 x 140 ft., with extension, 40 x 50 ft., for expansion in furnace department. Cost over $75,000 with equipment.

Canada

• **Dominion Truck Equipment Co., Ltd.,** 60 Ottawa Street South, Kitchener, Ont., motor truck equipment, has approved plans for two-story addition, 52 x 175 ft., for which superstructure will begin at once. Cost close to $100,000 with machinery.

Saskatchewan Power Commission, Saskatoon, Sask., plans addition to steam-electric power plant, including new turbine-generator unit and auxiliary equipment. Cost close to $350,000 with equipment.

McLennan Foundry & Machine Works, Ltd., Campbellton, N. B., plans one-story addition for production of materials for Dominion Government. Cost about $70,000 with equipment.

Moffats, Ltd., stoves, heaters, etc., 22 Dennison Road East, Weston, Ont., has awarded general contract to W. B. Sullivan, 30 Bloor Street East, Toronto, for plant addition, to cost $40,000 with equipment. Prack & Prack, 36 James Street South, Hamilton, Ont., are architects.

Aluminum Co. of Canada, Ltd., 1155 Metcalfe Street, Montreal, is considering plans for new works in Province of Quebec, to cost approximately $1,000,000.

Algoma Steel Corp., Ltd., Wilde Street, Sault Ste. Marie, Ont., has plans for addition to blooming mill and other enlargements to cost $4,000,000, financing to be provided by Canadian government. S. V. McLeod is purchasing agent for company.

Montreal Locomotive Works, Ltd., Longue Point, Que., has awarded contract to L. G. Ogilvie & Co., Ltd., 1440 St. Catharine Street West, Montreal, for superstructure in connection with new $1,000,000 plant at Montreal. Dominion Bridge Co., Ltd., Lachine, Que., has structural steel contract. This will be one unit of plant for production of war tanks and war equipment which ultimately will represent expenditure of $10,000,000, to be financed by government.